Nokia Customer Care

Service Manual

RM-424; RM-564 (Nokia 6720 classic; L3&4)

Mobile Terminal

Part No: (Issue 1)

COMPANY CONFIDENTIAL

NOKIA
Care

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Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	04/2009	MT	

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IMPORTANT

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Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- Never test a mobile phone WCDMA transmitter with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
- During testing never activate the GSM or WCDMA transmitter without a proper antenna load, otherwise GSM or WCDMA PA may be damaged.

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For your safety

QUALIFIED SERVICE

Only qualified personnel may install or repair phone equipment.

ACCESSORIES AND BATTERIES

Use only approved accessories and batteries. Do not connect incompatible products.

CONNECTING TO OTHER DEVICES

When connecting to any other device, read its user's guide for detailed safety instructions. Do not connect incompatible products.

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ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

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Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

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Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Li-Ion batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77° F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

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Nokia 6720 classic; L3&4 Service Manual Structure

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2 Service Tools and Service Concepts
3 BB Troubleshooting and Manual Tuning Guide
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Glossary

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1 — General Information

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Product selection

RM-424 is a HSDPA/HSUPA/WCDMA/GSM handportable phone with a monoblock form factor, GPS (A-GPS) support and a TV out connection. It supports EGSM850/900/1800/1900 and WCDMA900/1900/2100 bands, and CSD/HSCSD, GPRS/EGPRS, WCDMA/HSDPA/HSUPA data bearers.

For WCDMA the maximum bit rate is up to 384 kbit/s for downlink and 384 kbit/s for uplink with simultaneous CS speech or CS video (max. 64 kbit/s). The HSDPA peak is 10.2Mbps and HSUPA peak is 2Mbps (with limited use cases).

In PS/CS mode, RM-424 supports DTM Class with multi slot class 11 (max. 4 RX + 3TX, sum 5). With EGPRS this means maximum download speed of up to 236.8 kbit/s simultaneously with speech. With GPRS this means maximum download speed of up to 64.2 kbit/s simultaneously with speech.

In PS only mode, RM-424 supports MSC 32 (max. 5 Rx + 3 TX, sum 6) timeslots resulting in maximum download speed of up to 296kbit/s with EGPRS, and up to 107kbit/s with GPRS

RM-424 is an MMS (Multimedia Messaging Service) enabled multimedia device. The MMS implementation follows the OMA MMS standard release 1.2. RM-424 also supports Bluetooth 2.0 standard with the stereo audio profiles (A2DP & AVRCP).

RM-424 has a large 2.2'' QVGA (320 x 240 pixels) TFT display with 16 million colors, a 5 Megapixel main camera that has Carl Zeiss autofocus lens, an integrated dual flash, autofocus light, video light and a video recording indicator. The 2nd camera is for video calls, but can also be used for still imaging and video recording.

RM-424 uses Symbian 9.3 operating system, S60 (release 3.2) UI, and it supports the full Web Browser for S60, which brings desktop-like Web browsing experience to mobile devices.

RM-424 also supports MIDP Java 2.0, providing a good platform for compelling 3rd party applications.

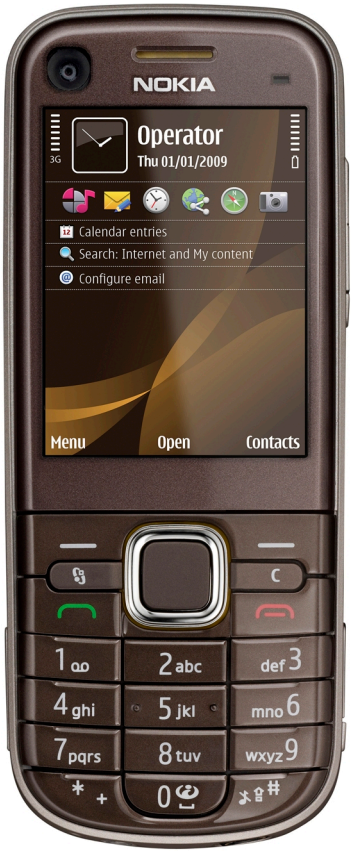

Figure 1 View of RM-424

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Product features and sales package

Bearers and transport

- CSD, HSCSD
- GPRS/EGPRS Class B, Multi slot class 32
- Dual Transfer Mode (DTM) class A, multi slot class 11
- WCDMA DL 384kbit/s, UL 384 kbit/s
- HSDPA up to 10.2Mbps
- HSUPA 2Mbps

Connectivity

- GPS (with A-GPS support)
- TV out
- Bluetooth 2.0 with stereo audio profiles (A2DP and AVRCP)
- High Speed USB with micro USB connector
- MicroSD memory card - support up to 8GB
- 3.5 mm AV Connector
- 2.0 mm DC jack

Display

- Large 2.2'' QVGA (320 x 240 pixels) TFT display with 16 million colors
- Digital Ambient Light Sensor (ALS) – used to optimize display/key brightness and power consumption
- Orientation sensor (accelerometer) assisted UI turn (portrate / landscape) and turn-to-mute

Imaging and video

- 5 Megapixel with Carl Zeiss autofocus lens, integrated dual Flash, autofocus light and video recording indicator
- 2nd camera for video calls, but also for still imaging and video recording
- Video streaming and sharing
- Dedicated keys for image capture, recording and zooming
- Image and video editors

Music

- Music player with MP3/AAC/AAC+/eAAC+/WMA support
- Active noise cancellation (eANC for downlink and 2- MIC noise cancellation for uplink)
- Speech codec support for AMR-WB, AMR, FR, EFR
- Stereo speaker
- RDS FM Radio

Productivity

Context management

- OMA DRM version 2.0
- PIM (Calendar + Contacts + Active Notes)

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- OTA provisioning & over the air SW update (FOTA)
- Ovi Suite
- Active Standby
- Active Synch data synchronization
- Web Browser (OSS), Java ™ MIDP 2.0, XHTML browsing over TCP/IP

Messaging

- Email (SMTP, IMAP4, POP3)
- SMS, MMS (OMA 1.3)
- Audio Messaging (AMS)

Voice

- Rich Calls: 2-way video conferencing (video call), video sharing
- Voice commands, enhanced voice dialling (SIND)
- Audio message reader for text messages and E-mail
- VoIP calls

Add-on software framework

- Symbian OS 9.3
- Nokia Series 60, 3rd edition, feature pack 3.2
- Java: MIDP2.0

Additional features

- City compass to support easy pedestrian routing and guidance
- Battery status LED around DC jack to indicate low battery and charging status
- Status LED light around navi-key to indicate events like missed call, SMS etc.
- Vibrating alert
- Speech codec support for AMR-WB, AMR, FR, EFR

Basic sales package

Basic sales package, there may be sales area variations.

- Transceiver RM-424
- Battery (BP-6MT/1050mAh)
- Charger AC-8
- Stereo headset (HS-125)
- Short micro USB connectivity cable (CA-101D)
- MicroSD card 1GB (MU-22)
- Mini-DVD (Ovi Suite)
- Short user guide

Product and module list

Module name	Type code	Notes
System/RF module PWB	2QM	

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Module name	Type code	Notes
Flash flex	2QF	
eANC flex	2QG	
Key UI flex	2QH	
System connector flex	2QJ	

Mobile enhancements

Table 1 Audio

Enhancement	Type
Headsets (stereo)	HS-45 + AD-54 (inbox)
	WH-500
	WH-600
Wireless headsets (BT stereo)	BH-503
	BH-504

Table 2 Car

Enhancement	Type
Car navigation	Nokia 500 Auto Navigation
Car kit	CK-7W
	CK-15W
	CK-100
	CK-300 (BT & plug-in)
	CK-600
FM transmitter	CA-300
Holder	CR-39
	CR-82
	CR-99
Mobile charger	DC-4
Mobile holder easy mount	HH-12
	HH-17
Plug-in car handsfree	HF-200
	HF-300
	HF-310
	HF-510

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Table 3 Data

Enhancement	Type
MicroSD card, 512MB	MU-28
MicroSD card, 1GB	MU-22
MicroSD card, 2GB	MU-37
MicroSD card, 4GB	MU-41
MicroSD card, 8GB	MU-43
MicroSD card, 16GB	MU-44
Micro USB connectivity adapter cable	CA-101/CA_101D

Table 4 Messaging

Enhancement	Type
Digital pen	SU-27W
Wireless keyboard	SU-8W

Table 5 Music

Enhancement	Type
Bluetooth speakers	MD-5W (BT & plug-in)
	MD-7W (BT & plug-in)
Music speakers	MD-6
	MD-8

Table 6 Navigation

Enhancement	Type
Wireless GPS module	LD-3W
	LD-4W

Table 7 Power

Enhancement	Type
Battery 1050mAh Li-ion	BP-6MT
Charger adapter	DT-14

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Enhancement	Type
Charger	AC-5
	AC-8
	DC-8
	DC-9
	DC-11

Technical specifications

Transceiver general specifications

Unit	Dimensions (L x W x T) (mm)	Weight (g)	Volume (cm^3)
Transceiver with BP-6MT 1050mAh Li-ion battery back	110 x 45 x 14	110	64

Main RF characteristics for GSM850/900/1800/1900 and WCDMA VIII/II/I phones

Parameter	Unit
Cellular system	GSM850, EGSM900, GSM1800/1900, WCDMA VIII (900), WCDMA II (1900) and WCDMA I (2100)
Rx frequency band	GSM850: 869 - 894 MHz
	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA VIII (900): 925- 960 MHz
	WCDMA II (1900): 1930-1990MHz
	WCDMA I (2100): 2110 - 2170 MHz
Tx frequency band	GSM850: 824 - 849 MHz
	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA VIII (900): 880 - 915 MHz
	WCDMA II (1900): 1850-1910MHz
	WCDMA I (2100): 1920 - 1980 MHz

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Parameter	Unit
Output power	GSM850: +5 ...+33dBm/3.2mW ... 2W
	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
	WCDMA VIII (900): -50 ... +24 dBm/0.01µW ... 251.2mW
	WCDMA II (1900): -50 ... +24dBm/0.01µW ... 251.2mW
	WCDMA I (2100): -50 ... +24 dBm/0.01µW ... 251.2mW
EDGE output power	EDGE850: +5 ... +29dBm/3.2mW ... 794mW
	EDGE900: +5 ... +29dBm/3.2mW ... 794mW
	EDGE1800: +0 ... +26dBm/1.0mW ... 400mW
	EDGE1900:+0 ... +26dBm/1.0mW ... 400mW
Number of RF channels	GSM850: 124
	GSM900: 174
	GSM1800: 374
	GSM1900: 299
	WCDMA VIII (900): 152
	WCDMA II (1900): 289
	WCDMA I (2100): 277
Channel spacing	200 kHz (WCDMA II 100/200 kHz)
Number of Tx power levels	GSM850: 15
	GSM900: 15
	GSM1800: 16
	GSM1900: 16
	WCDMA VIII (900): 75
	WCDMA II (1900): 75
	WCDMA I (2100): 75

Battery endurance

Battery	Capacity (mAh)	Talk time	Stand-by
BP-6MT	1050	Up to 7.1 h (GSM) Up to 4.3 h (WCDMA)	Up to 525 h (GSM) Up to 404 h (WCDMA)

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Environmental conditions

Temperature conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15ºC...+55ºC	Specifications fulfilled
Reduced performance	-25ºC...-15ºC +55ºC...+70ºC	Operational for shorts periods only
Intermittent operation	-40ºC...-15ºC +70ºC...+85 ºC	Operation not guaranteed but an attempt to operate does not damage the phone.
No operation or storage	<-40ºC...>+85ºC	No storage or operation: an attempt may damage the phone.
Charging allowed	-25ºC...+50ºC	
Long term storage conditions	0ºC...+85ºC	

Humidity

Relative humidity range is 5...95%.

The HW module is not protected against water. Condensed or splashed water might cause malfunction. Any submerge of the phone will cause permanent damage. Long-term high humidity, with condensation, will cause permanent damage because of corrosion.

Vibration

The module should withstand the following vibrations:

- 5 - 10 Hz; +10dB / octave
- 10 - 50 Hz; 5.58 m^2 / s^3 (0.0558 g^2/ Hz)
- 50 - 300 Hz; - 10 dB / octave

ESD strength

Conducted discharge is 8 kV (>10 discharges) and air contact 15 kV (>10 discharges).

The standard for electrostatic discharge is IEC 61000-4-2, and this device fulfils level 4 requirements.

RoHS

This device uses RoHS compliant components and lead-free soldering process.

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2 — Service Tools and Service Concepts

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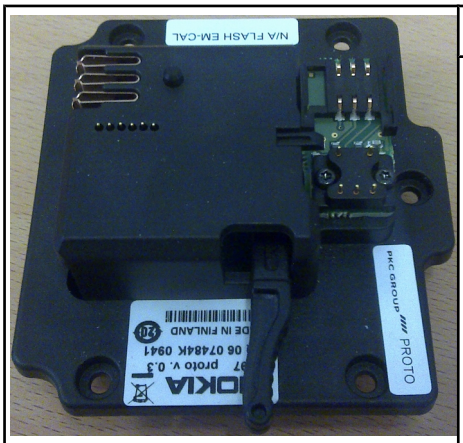
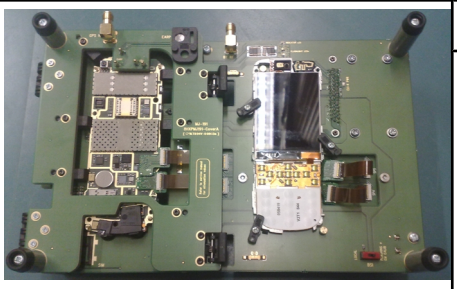
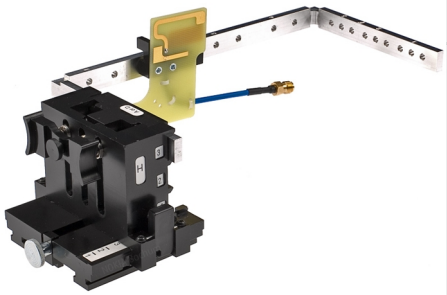
Service tools

Product specific tools

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-424; RM-564. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

	FS-97	Flash adapter	
	For flashing (also dead phones) with SS-46. RF testing (with RF coupler), and EM calibration on ATO level with SS-62 (mechanical locking concept), CU-4 supported.		
	MJ-191	Module jig	
	MJ-191 is meant for troubleshooting, testing, tuning and flashing on the engine level (CU-4 supported). The jig includes an RF interface for GSM, WCDMA, Bluetooth and GPS.		
	RJ-230	Soldering jig	
	RJ-230 is a soldering jig used for soldering and as a rework jig for the engine module.		
	SA-131	RF coupler	
	SA-131 is a generic device for GPS testing. It is used together with SS-62.		

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SA-157	RF coupler	

SA-157 is an RF coupler for WCDMA and GSM RF testing. It is used together with the product-specific flash adapter.

The following table shows attenuations from the antenna pads of the mobile terminal to the SMA connectors of SA-157 . The setup used for measuring the values is SA-157 + FS-97 + SS-62 + CU-4.

- **Attenuation values for inductive RF coupler SA-157**

Band	Channel	Attenuation RX (dB)	Attenuation TX (dB)
GSM 850	Low	7.7	11.4
	Mid	7.8	10.5
	High	6.5	8.8
GSM 900	Low	5.7	7.3
	Mid	6.7	7.4
	High	5.8	6.7
GSM 1800	Low	13.9	15.0
	Mid	12.8	14.1
	High	15.7	12.8
GSM 1900	Low	13.3	13.6
	Mid	13.5	14.1
	High	14.0	13.2
WCDMA Band I	Low	17.1	12.8
	Mid	18.0	13.3
	High	18.2	12.6
WCDMA Band II	Low	13.6	12.9
	Mid	13.0	13.4
	High	14.4	13.1
WCDMA Band VIII	Low	6.3	8.0
	Mid	7.1	7.5
	High	6.5	6.9

Using SA-131 GPS RF coupler with RM-424

Use the following basic SA-131 setup for RM-424:

- 1575.520152 MHz
- -110dbm
- 20db fixed RF attenuator

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- 12 db product specific RF attenuation

And use the following settings for the SA-131:

- Base setting: 2
- Sledge setting: 2
- Frame setting: A1
- Coupler setting: A2
- Direction: Down

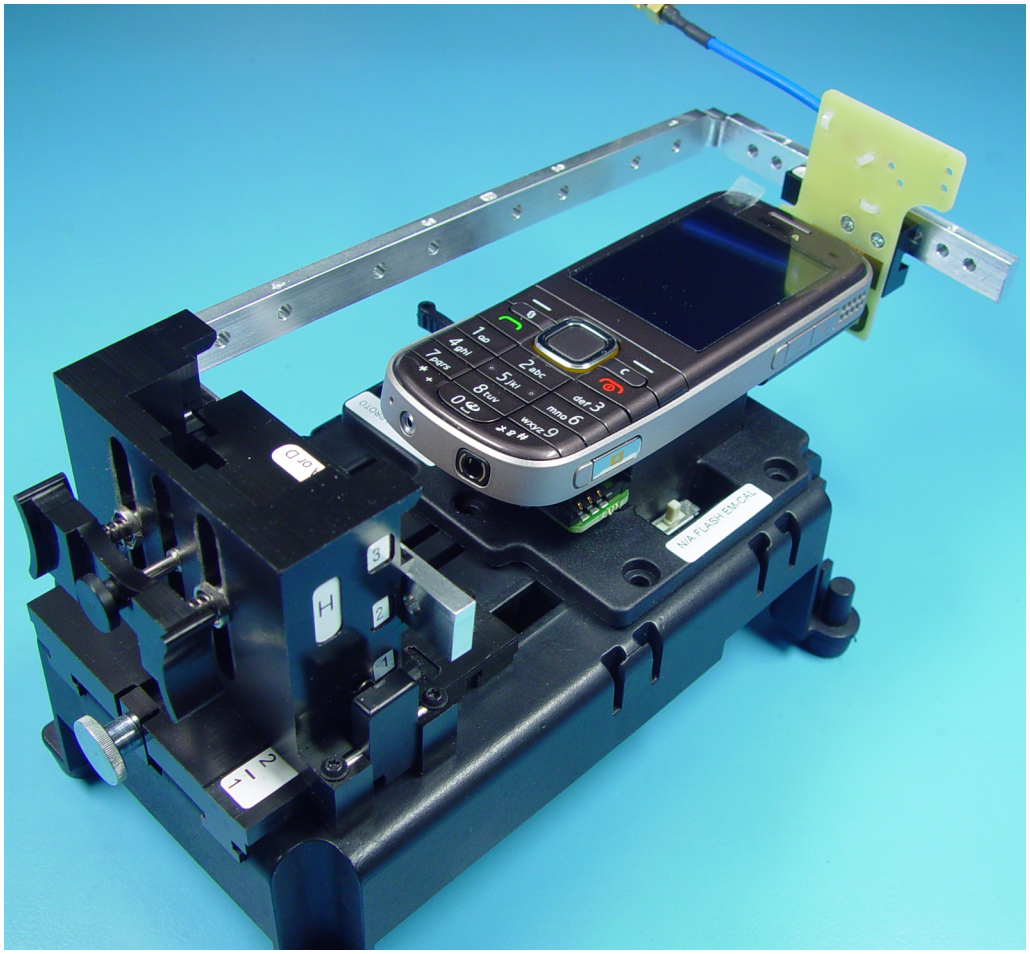

Figure 2 Base setting for SA-131

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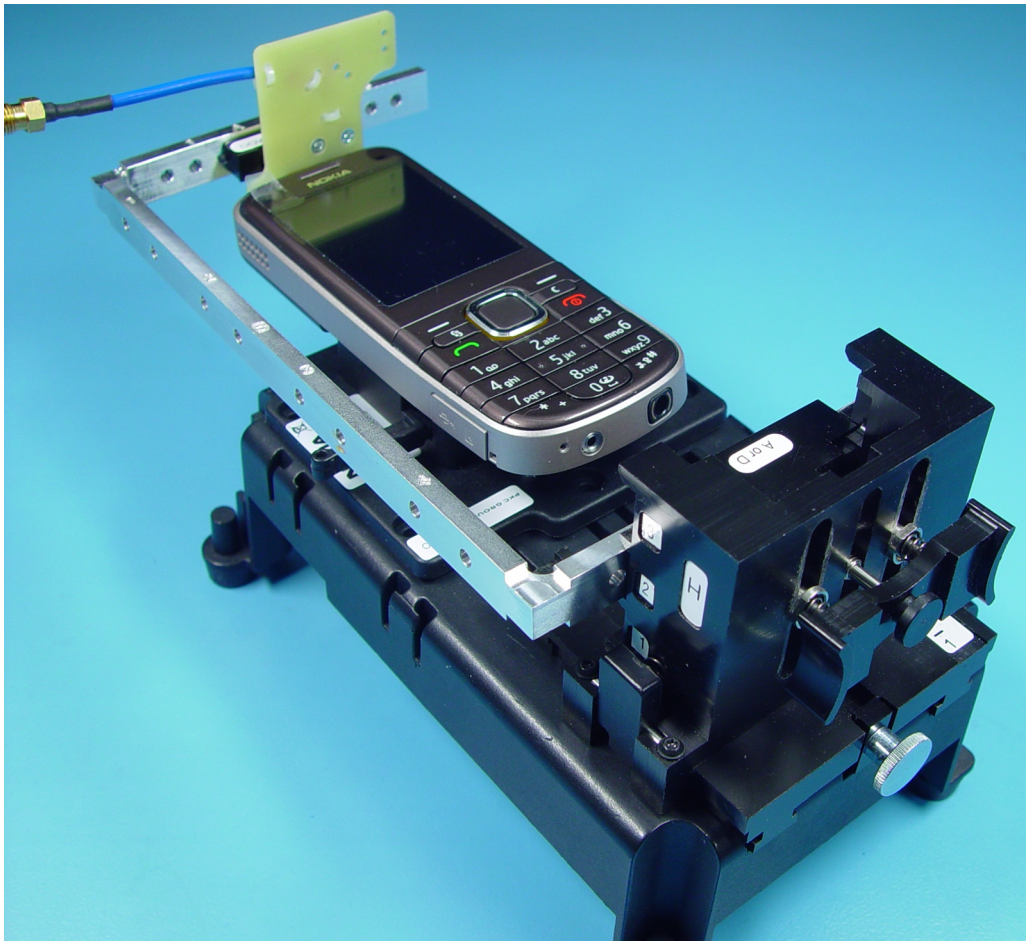
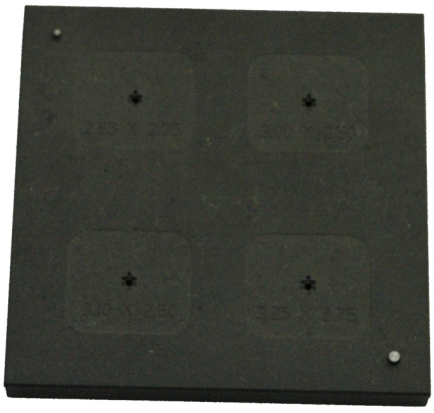


Figure 3 Coupler setting for SA-131

Rework jigs and stencils

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-424; RM-564. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

	RJ-160	Rework jig	
	RJ-160 is a rework jig used when servicing the WCDMA duplexer (Z7540). It is used together with the ST-55 stencil.		

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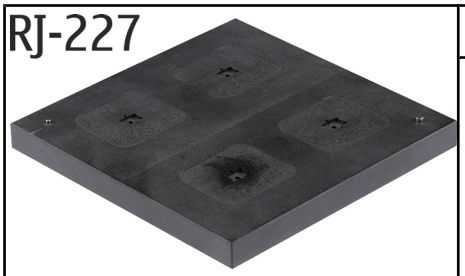
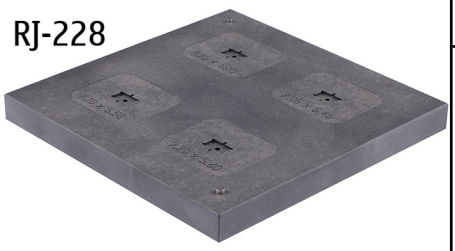
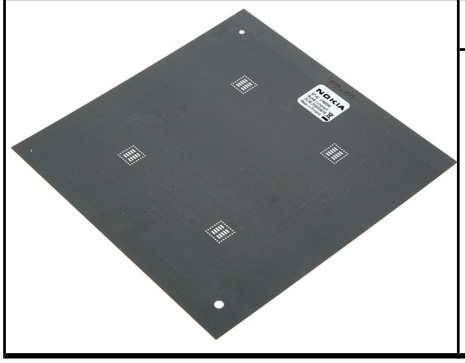
RJ-227 	RJ-227	Rework jig	
	RJ-227 is a rework jig used when servicing the BTHFM module (D6000). It is used together with the ST-70 rework stencil.		
RJ-228 	RJ-228	Rework jig	
	RJ-228 is a rework jig used when servicing the WCDMA PA (N7540) component. It is used together with the ST-71 stencil.		
	RJ-73	Rework jig	
	RJ-73 is a rework jig used when servicing the N1400 component. It is used together with the ST-29 rework stencil.		
	RJ-93	Rework jig	
	RJ-93 is used as a rework jig for the Front End Module (FEM). This rework jig takes the FEM or power amplifier (PA) module (N7520) for spreading the soldering paste to the component. Must be used together with the ST-40 stencil.		
	ST-29	rework stencil	
	ST-29 is a rework stencil used when servicing the N1400 component. It is used together with rework jig RJ-73.		
	ST-40	Rework stencil	
	ST-40 is a rework stencil that is used with the RJ-93 rework jig to service the Front End Module (N7520).		

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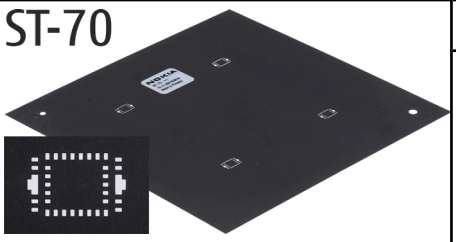
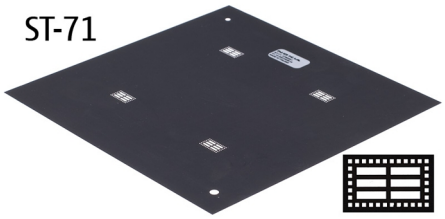
	ST-55	Rework stencil	
	ST-55 is a rework stencil used when servicing the Z7540 and Z7541 duplexers. It is used together with the rework jigs RJ-157 and RJ-160.		
	ST-70	Rework stencil	
	ST-70 rework stencil is used with RJ-227 rework jig to service the BTHFM module (D6000).		
	ST-71	Rework stencil	
	ST-71 is a rework stencil used when servicing the WCDMA PA (N7540) component. It is used together with rework jig RJ-228.		

General tools

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-424; RM-564. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

	AC-33	Power supply	
	Universal power supply for FPS-10; included in the FPS-10 sales package.		
	AC-35	Power supply	
	Universal power supply for FPS-21; included in the FPS-21 sales package. Also available as a separate spare part. Input 100V...230V 50Hz...60Hz, output voltage of 12 V and output current up to 3 A.		

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CU-4

CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

1 Connect a service tool (jig, flash adapter) to CU-4.
2 Connect CU-4 to your PC with a USB cable.
3 Connect supply voltage (12 V)
4 Connect an FBUS cable (if necessary).
5 Start Phoenix service software.

Note: Phoenix enables CU-4 regulators via USB when it is started.

Reconnecting the power supply requires a Phoenix restart.

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FLS-5	Flash device	

FLS-5 is a dongle and flash device incorporated into one package, developed specifically for POS use.

Note: FLS-5 can be used as an alternative to PKD-1.

FPS-10	Flash prommer	

FPS-10 interfaces with:

- PC
- Control unit
- Flash adapter
- Smart card

FPS-10 flash prommer features:

- Flash functionality for BB5 and DCT-4 terminals
- Smart Card reader for SX-2 or SX-4
- USB traffic forwarding
- USB to FBUS/Flashbus conversion
- LAN to FBUS/Flashbus and USB conversion
- Vusb output switchable by PC command

FPS-10 sales package includes:

- FPS-10 prommer
- Power Supply with 5 country specific cords
- USB cable

Note: FPS-21 is substitute FPS-10 if FPS-10 has not been set up.

Note: FPS-10 is not available anymore.

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FPS-21

FPS-21	Flash prommer	

FPS-21 sales package:

- FPS-21 prommer
- AC-35 power supply
- CA-31D USB cable

FPS-21 interfaces:

Front

- Service cable connector

  Provides Flashbus, USB and VBAT connections to a mobile device.
- SmartCard socket

  A SmartCard is needed to allow DCT-4 generation mobile device programming.

Rear

- DC power input

  For connecting the external power supply (AC-35).
- Two USB A type ports (USB1/USB3)

  Can be used, for example, for connecting external storage memory devices or mobile devices
- One USB B type device connector (USB2)

  For connecting a PC.
- Phone connector

  Service cable connection for connecting Flashbus/FLA.
- Ethernet RJ45 type socket (LAN)

  For connecting the FPS-21 to LAN.

Inside

- Four SD card memory slots

  For internal storage memory.

  Note: In order to access the SD memory card slots inside FPS-21, the prommer needs to be opened by removing the front panel, rear panel and heatsink from the prommer body.

  Note: FPS-10 can be used for flashing instead of FPS-21 if necessary.

JXS-1	RF shield box	

Because the WCDMA network disturbs the RX side testing of the WCDMA phone and the Tx signal of the WCDMA phone can severely disturb the WCDMA network, a shield box is needed in all testing, tuning and fault finding which requires WCDMA RF signal.

The shield box is not an active device, it contains only passive filtering components for RF attenuation.

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	PK-1	Software protection key	
	PK-1 is a hardware protection key with a USB interface. It has the same functionality as the PKD-1 series dongle. PK-1 is meant for use with a PC that does not have a series interface. To use this USB dongle for security service functions please register the dongle in the same way as the PKD-1 series dongle.		
	PKD-1	SW security device	
	SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC. Without the device, it is not possible to use the service software. Printer or any such device can be connected to the PC through the device if needed.		
	SB-6	Bluetooth test and interface box (sales package)	
	The SB-6 test box is a generic service device used to perform Bluetooth bit error rate (BER) testing, and establishing cordless FBUS connection via Bluetooth. An ACP-8x charger is needed for BER testing and an AXS-4 cable in case of cordless interface usage testing . Sales package includes: • SB-6 test box • Installation and warranty information		
	SPS-1	Soldering Paste Spreader	
	The SPS-1 allows spreading of solder to the LGA components pads over the rework stencils. **Note:** Existing solder paste stencils and component holder jigs will be supported until January 2009. For all new parts needing solder paste support after January 1, 2009, please contact your solder machine manufacturer for the universal solutions for solder paste application for rework purposes.		

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SPS-2	Soldering paste spreader	

Note: Existing solder paste stencils and component holder jigs will be supported until January 2009. For all new parts needing solder paste support after January 1, 2009, please contact your solder machine manufacturer for the universal solutions for solder paste application for rework purposes.

SRT-6	Opening tool	

SRT-6 is used to open phone covers.

Note: The SRT-6 is included in the Nokia Standard Toolkit.

SS-100

SS-100	Camera removal tool	

The camera removal tool SS-100 is used to remove/attach a camera module from/to the camera socket of the phone PWB.

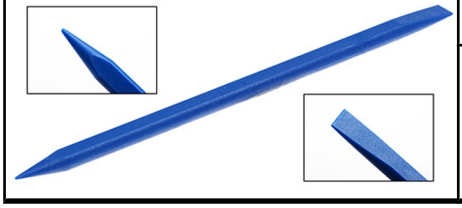
SS-46

SS-46	Interface adapter	

SS-46 acts as an interface adapter between the flash adapter and FPS-10.

SS-62	Generic flash adapter base for BB5	

- generic base for flash adapters and couplers
- SS-62 equipped with a clip interlock system
- provides standardised interface towards Control Unit
- provides RF connection using galvanic connector or coupler
- multiplexing between USB and FBUS media, controlled by VUSB



SS-93	Opening tool	

SS-93 is used for opening JAE connectors.

Note: The SS-93 is included in Nokia Standard Toolkit.

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	SX-4	Smart card	
	SX-4 is a BB5 security device used to protect critical features in tuning and testing. SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.		

Cables

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-424; RM-564. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

	CA-101	Micro USB cable	
	The CA-101 is a USB-to-microUSB data cable that allows connections between the PC and the phone.		
	CA-31D	USB cable	
	The CA-31D USB cable is used to connect FPS-10 or FPS-11 to a PC. It is included in the FPS-10 and FPS-11 sales packages.		

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CA-35S	Power cable	

CA-35S is a power cable for connecting, for example, the FPS-10 flash prommer to the Point-Of-Sales (POS) flash adapter.

CA-58RS	RF tuning cable	

Product-specific adapter cable for RF tuning.

- **Table 8 Attenuation values**

Band	Attenuation Rx/Tx
GSM850/900	0.2...0.3 dB
GSM1800/1900	0.3...0.4 dB
WCDMA900	0.2...0.3 dB
WCDMA2100	0.3...0.4 dB

CA-89DS	Cable	

Provides VBAT and Flashbus connections to mobile device programming adapters.

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DAU-9S	MBUS cable	

The MBUS cable DAU-9S has a modular connector and is used, for example, between the PC's serial port and module jigs, flash adapters or docking station adapters.

Note: Docking station adapters valid for DCT4 products.

PCS-1	Power cable	

The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled voltage.

XCS-4	Modular cable	

XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.

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	XRS-6	RF cable	
	The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment. SMA to N-Connector approximately 610 mm. Attenuation for: • GSM850/900: 0.3+-0.1 dB • GSM1800/1900: 0.5+-0.1 dB • WCDMA/WLAN: 0.6+-0.1dB		

Service concepts

POS (Point of Sale) flash concept

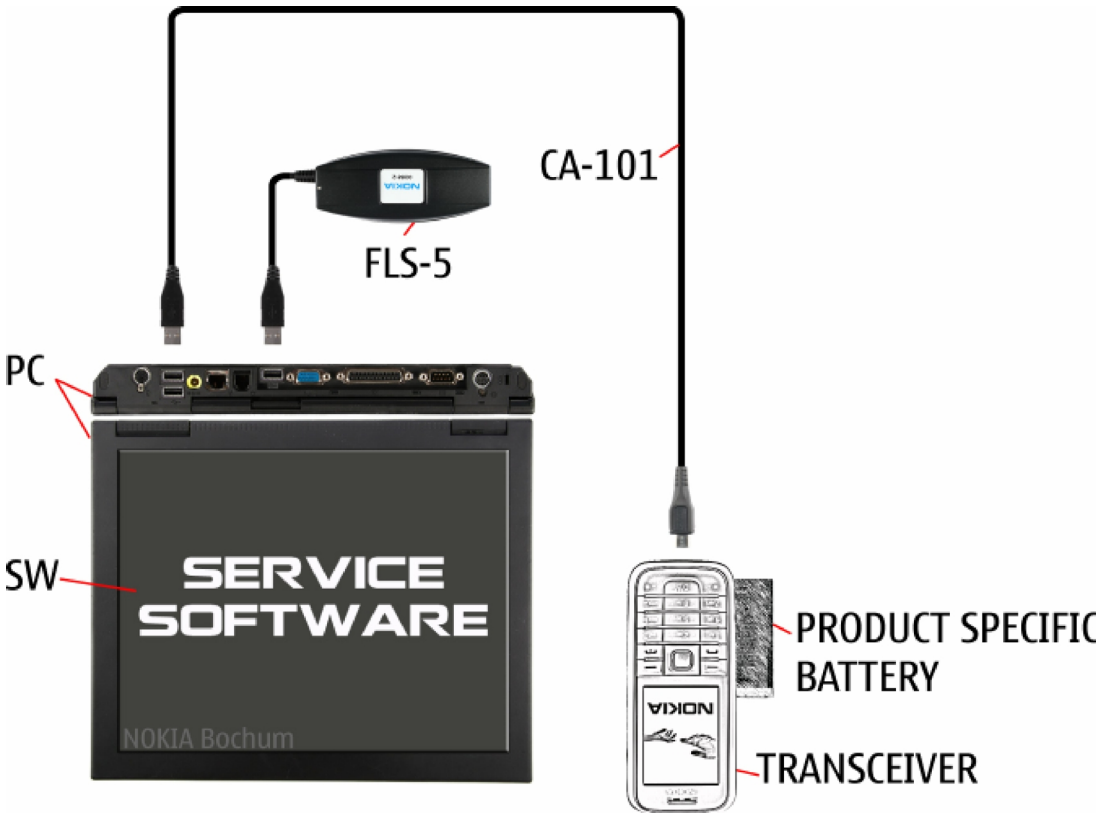

Figure 4 POS flash concept

Type	Description
Product specific tools	
BP-6MT	Battery
Other tools	
FLS-5	POS flash dongle
	PC with Phoenix service software

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Type	Description
Cables	
CA-101	Micro USB cable

Flash concept with FPS-10

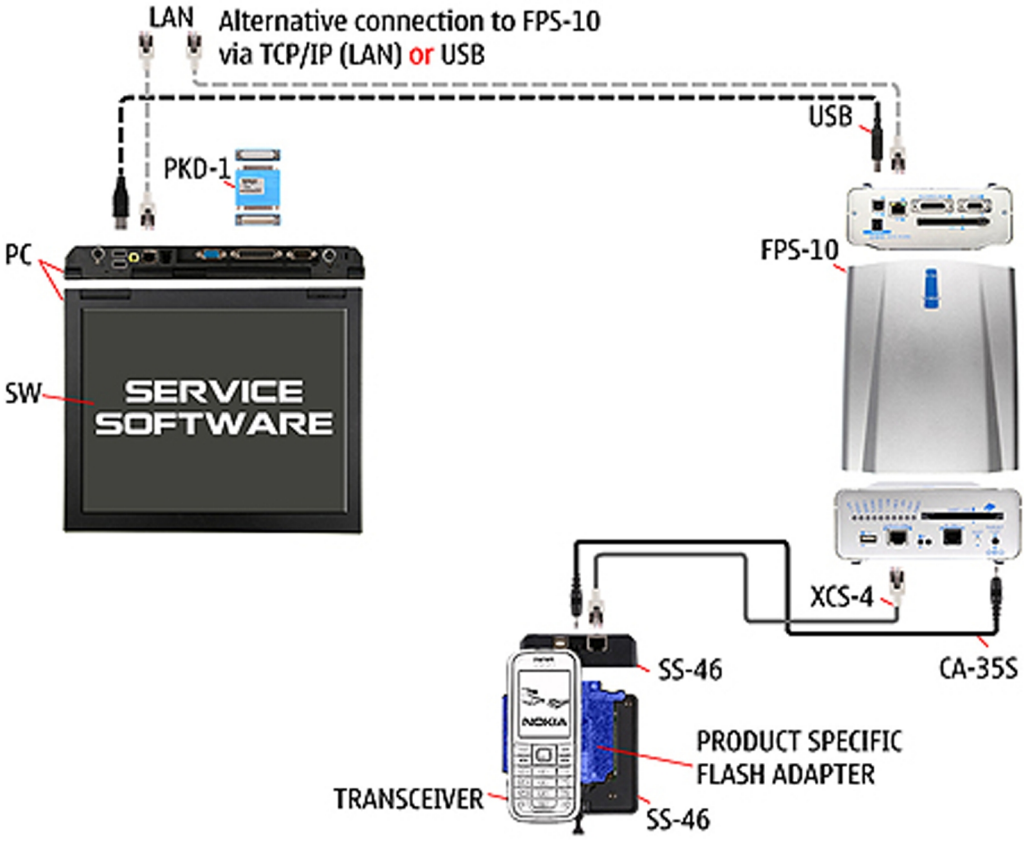

Figure 5 Basic flash concept with FPS-10

Type	Description
Product specific devices	
FS-97	Flash adapter
Other devices	
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-46	Interface adapter
	PC with Phoenix service software
Cables	
XCS-4	Modular cable
CA-35S	Power cable
	USB cable

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Flash concept with FPS-21

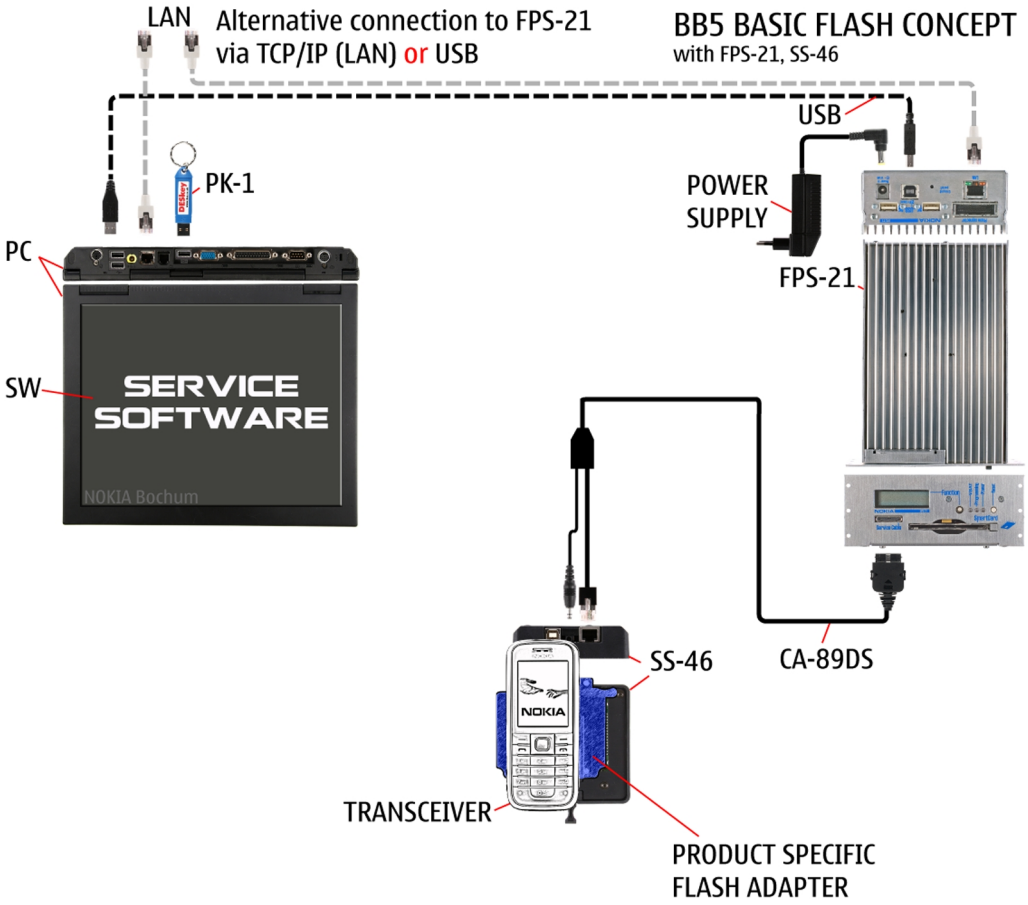

Figure 6 Basic flash concept with FPS-21

Type	Description
Product specific devices	
FS-97	Flash adapter
Other devices	
FPS-21	Flash prommer box
AC-35	Power supply
PK-1/PKD-1	SW security device
SS-46	Interface adapter
	PC with Phoenix service software
Cables	
CA-89DS	Service cable
	USB cable

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CU-4 flash concept with FPS-10

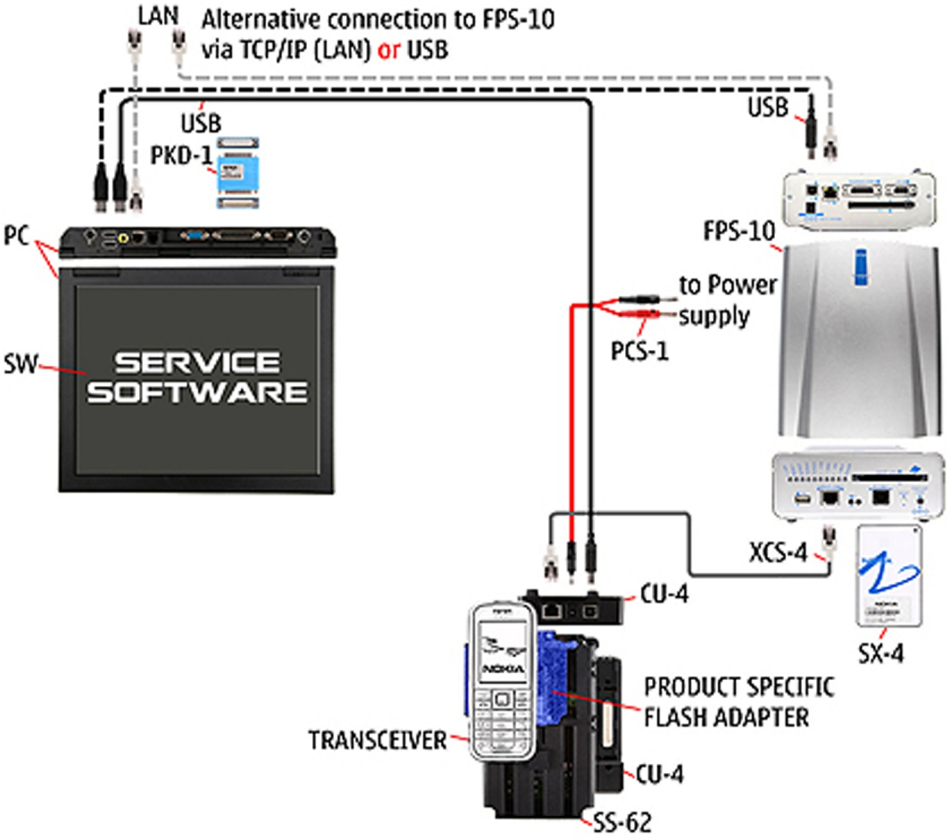

Figure 7 CU-4 flash concept with FPS-10

Type	Description
Product specific devices	
FS-97	Flash adapter
Other devices	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
SX-4	Smart card
	PC with Phoenix service software
Cables	
PCS-1	Power cable
XCS-4	Modular cable
	Standard USB cable
	USB cable

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CU-4 flash concept with FPS-21

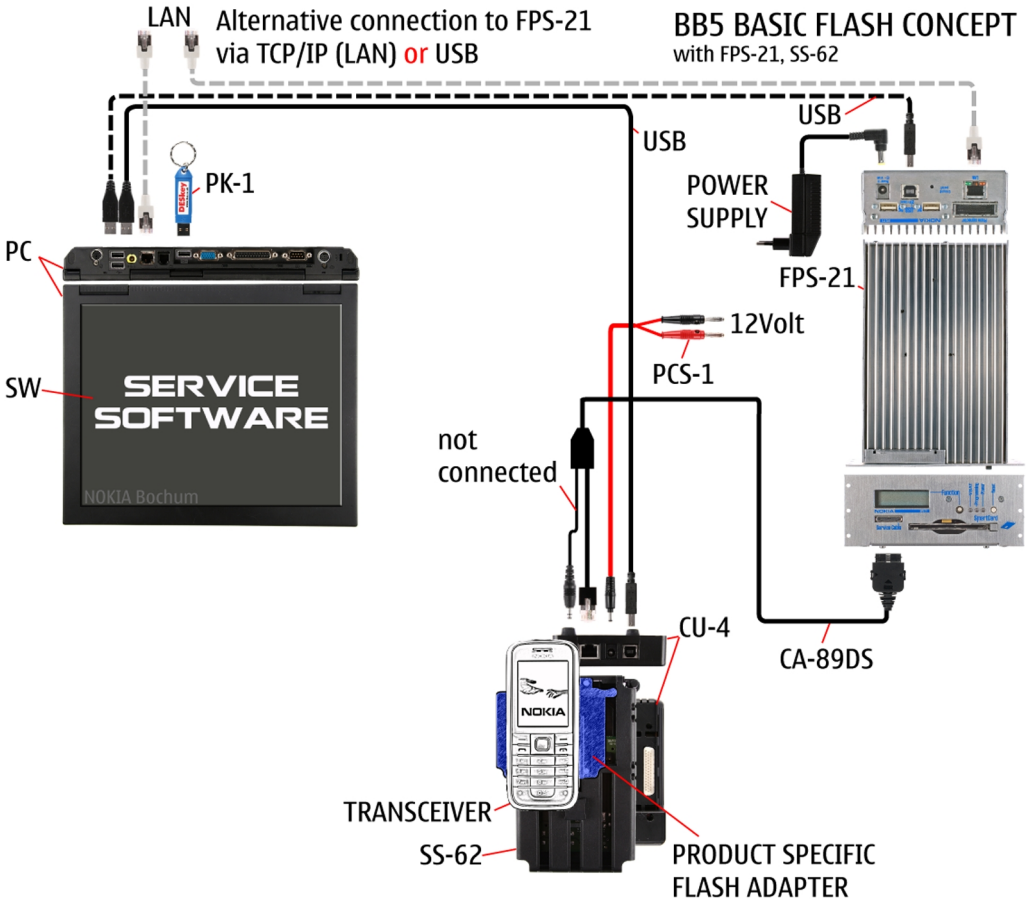

Figure 8 CU-4 flash concept with FPS-21

Type	Description
Product specific devices	
FS-97	Flash adapter
Other devices	
CU-4	Control unit
FPS-21	Flash prommer box
AC-35	Power supply
PK-1/PKD-1	SW security device
SS-62	Flash adapter base
SX-4	Smart card (for DCT-4 generation mobile device programming)
	PC with Phoenix service software
Cables	
PCS-1	Power cable
CA-89DS	Service cable
	Standard USB cable

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Type	Description
	USB cable

Module jig service concept

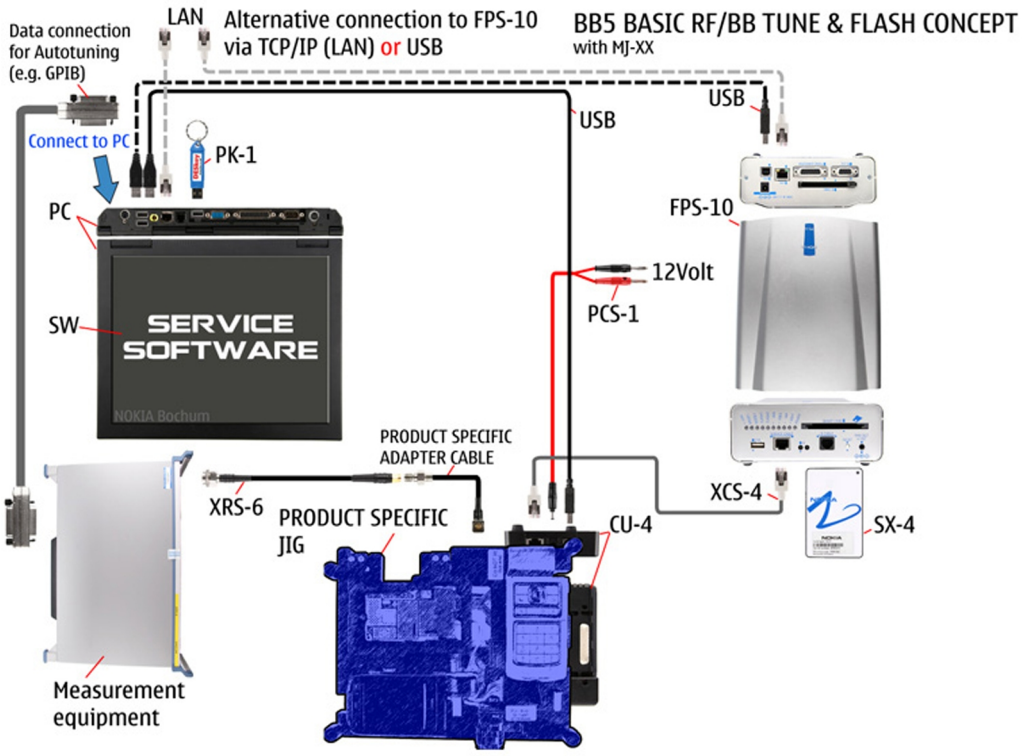

Figure 9 Module jig service concept

Type	Description
Phone specific tools	
MJ-191	Module jig
Other tools	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SX-4	Smart card
	PC with Phoenix service software
	Measurement equipment
Cables	
CA-58RS	RF service cable (product-specific adapter cable)
PCS-1	DC power cable
XCS-4	Modular cable
XRS-6	RF cable

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Type	Description
	USB cable
	GPIB control cable

RF testing concept with RF coupler

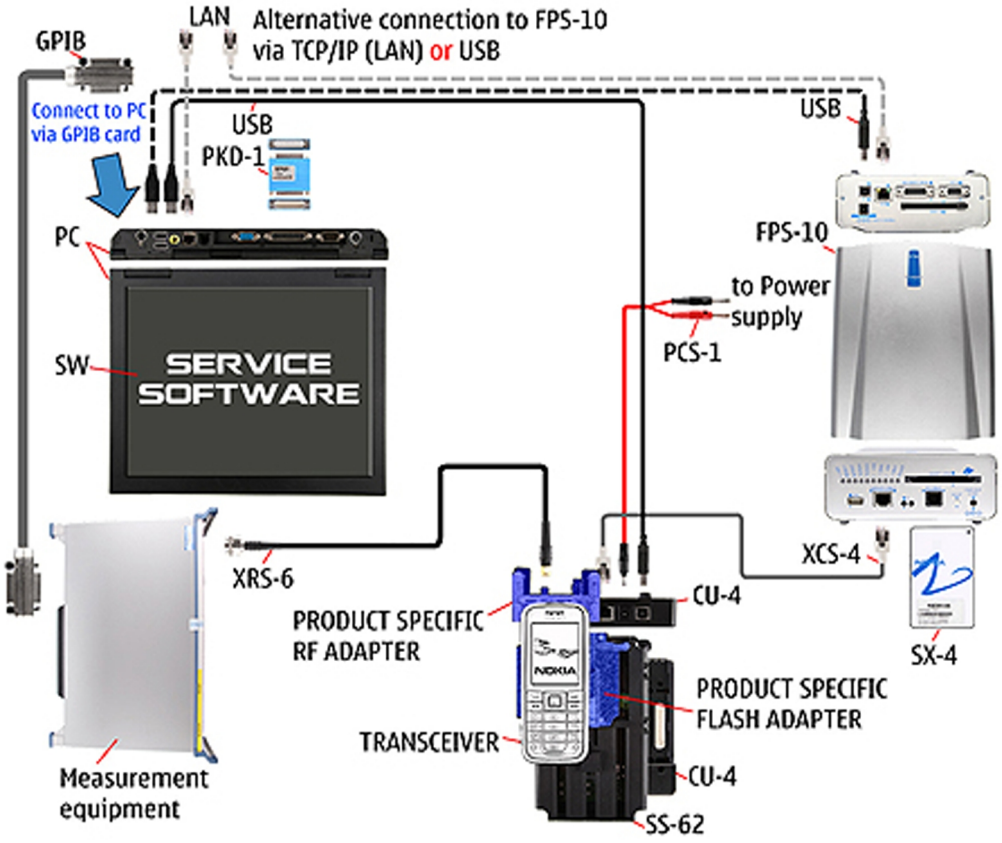

Figure 10 RF testing concept with RF coupler

Type	Description
Product specific devices	
FS-97	Flash adapter
SA-157	RF coupler
Other devices	
CU-4	Control unit
SX-4	Smart card
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
	Measurement equipment
	PC with Phoenix service software
Cables	

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Type	Description
PCS-1	Power cable
XCS-4	Modular cable
XRS-6	RF cable
	GPIB control cable
	USB cable

RF testing / BB tuning concept

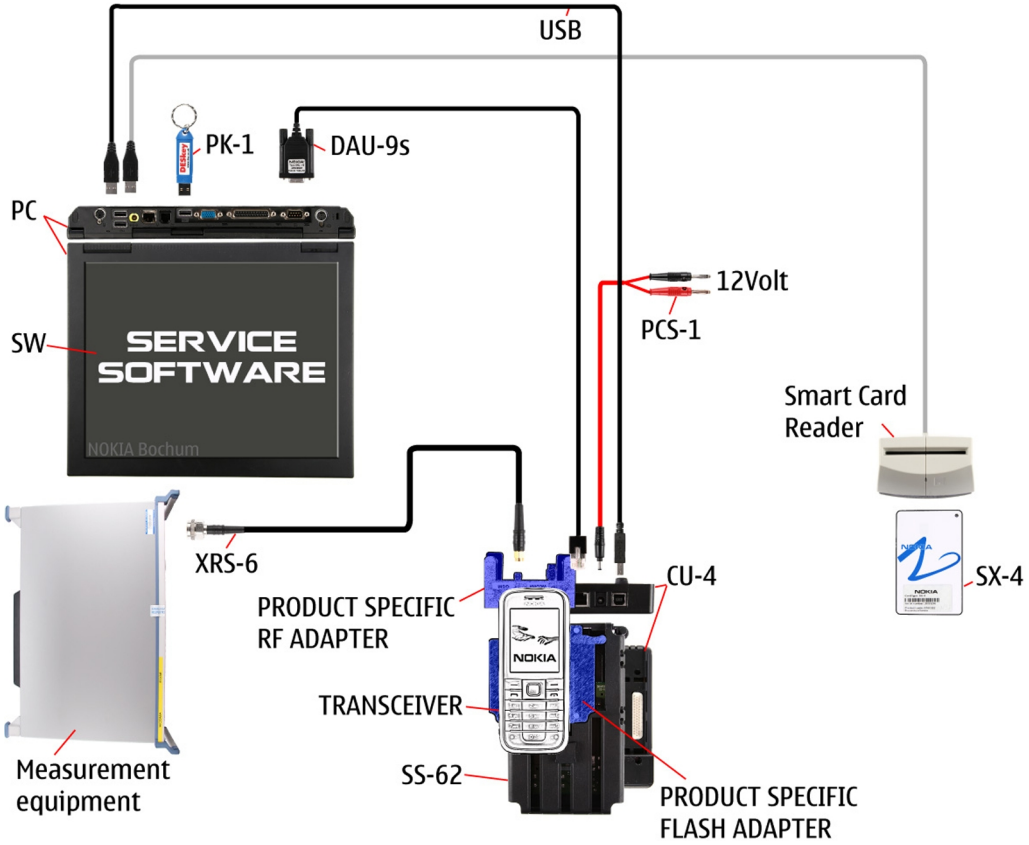

Figure 11 RF testing / BB tuning concept

Type	Description
Product specific tools	
FS-97	Flash adapter
SA-157	RF coupler
Other tools	
CU-4	Control unit
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
SX-4	Smart card
	Measurement equipment

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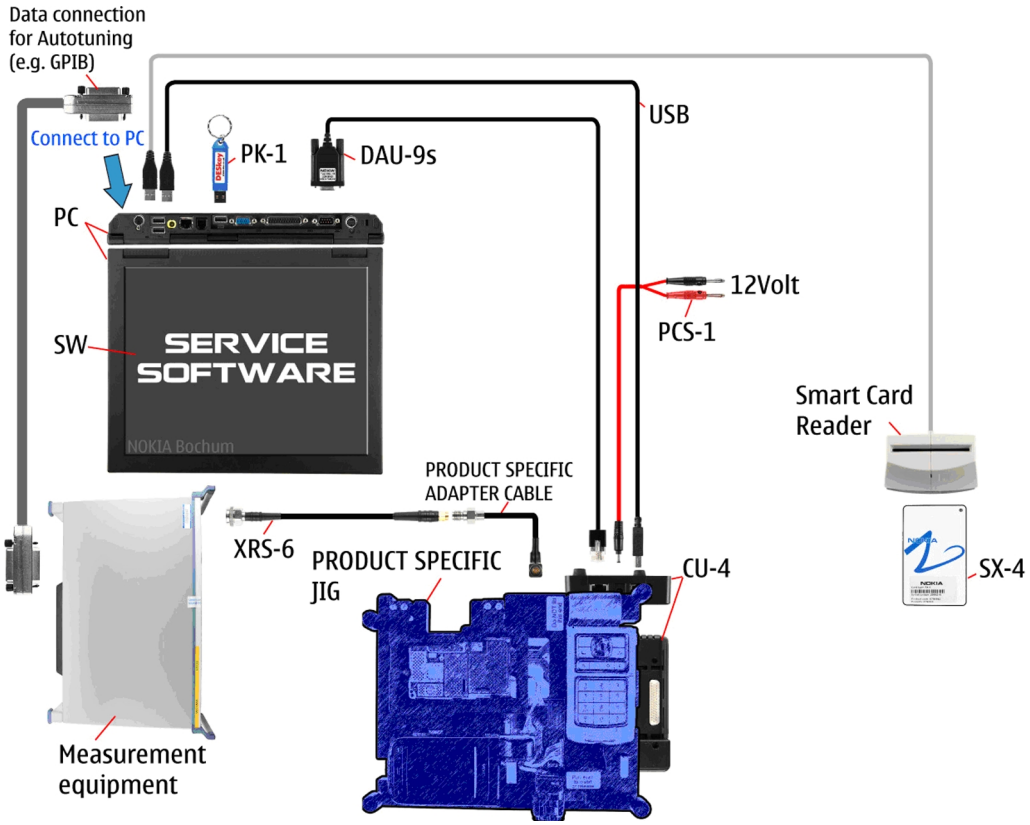
Type	Description
	Smart card reader
	PC with Phoenix service software
Cables	
DAU-9s	MBUS cable
PCS-1	DC power cable
XRS-6	RF cable
	USB cable

BB/RF tuning concept with module jig



Type	Description
Product specific tools	
MJ-191	Module jig
Other tools	
CU-4	Control unit
PKD-1	SW security device
SX-4	Smart card
	PC with Phoenix service software
	Smart card reader

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Type	Description
Cables	
DAU-9S	MBUS cable
PCS-1	Power cable
XRS-6	RF cable
	USB cable

Bluetooth testing concept with SB-6

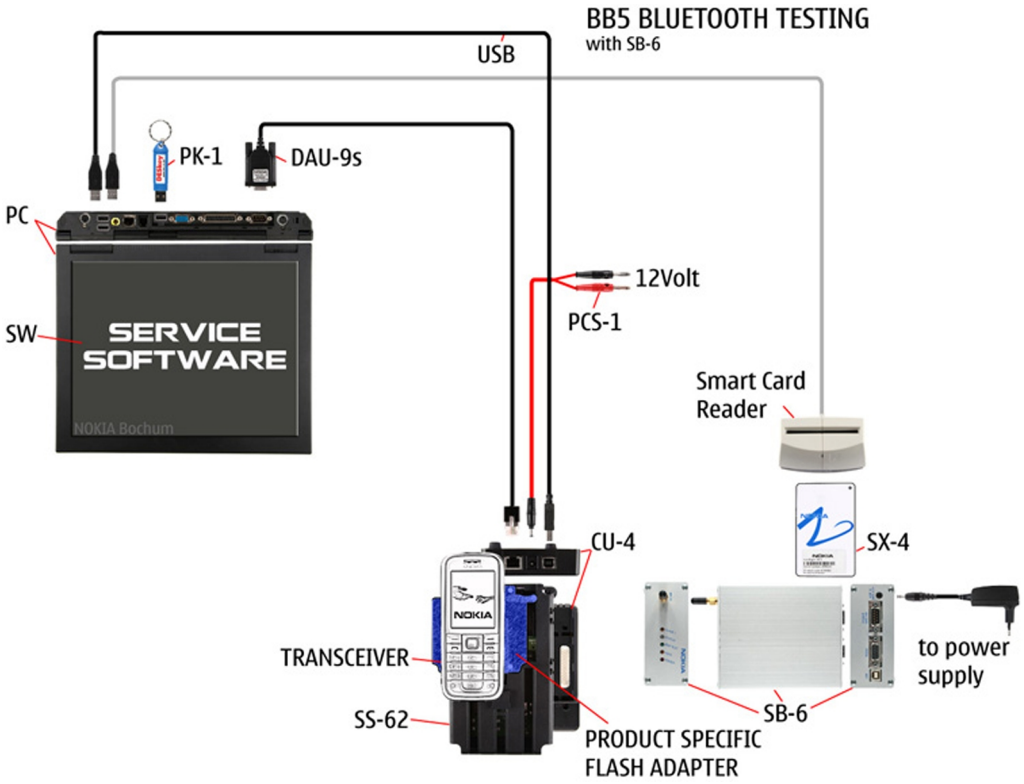

Figure 12 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific devices	
FS-97	Flash adapter
Other devices	
CU-4	Control unit
SS-62	Flash adapter base
PK-1	SW security device
SX-4	Smart card
SB-6	Bluetooth test and interface box
	Smart card reader
	PC with Phoenix service software

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Type	Description
Cables	
DAU-9S	MBUS cable
PCS-1	DC power cable
	USB cable

GPS testing concept with GPS RF coupler

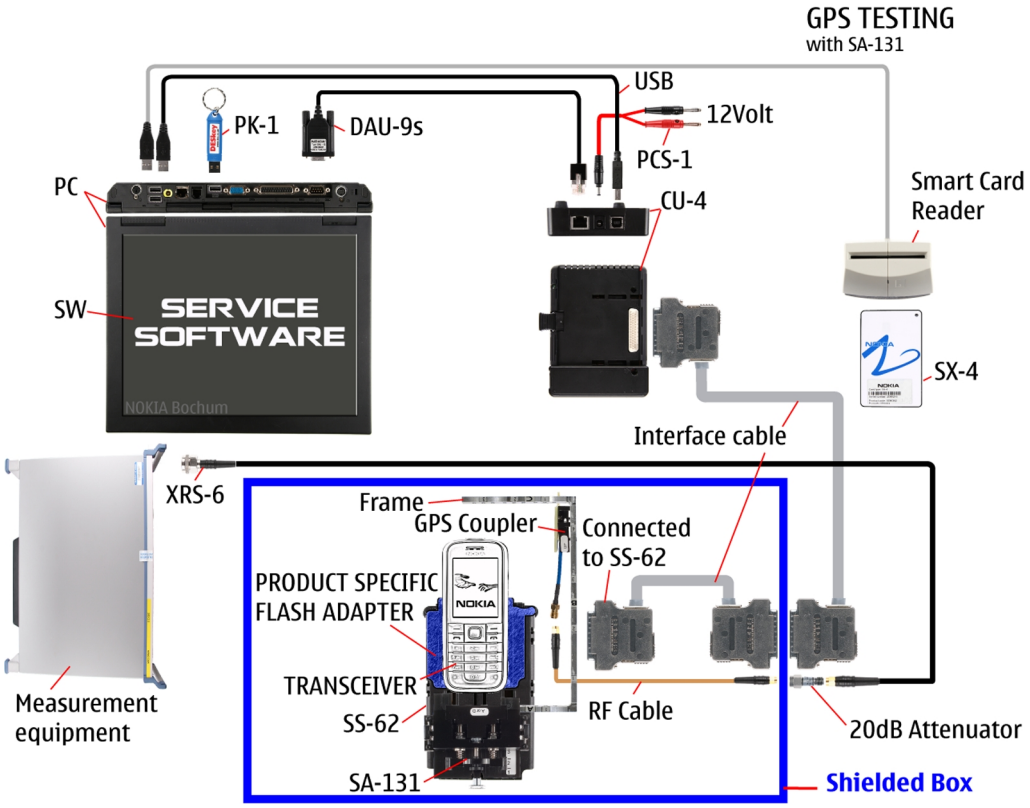

Figure 13 RF testing concept with RF coupler

Type	Description
Product specific devices	
FS-97	Flash adapter
SA-131	GPS RF coupler
Other devices	
CU-4	Control unit
SX-4	Smart card
JXS-1	RF shield box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
	Smart card reader

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Type	Description
	Measurement equipment
	PC with Phoenix service software
Cables	
CA-58RS	RF service cable (product-specific adapter cable)
PCS-1	Power cable
DAU-9S	MBUS cable
XRS-6	RF cable
	20dB attenuator
	Interface cable
	USB cable

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3 — BB Troubleshooting and Manual Tuning Guide

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Baseband self tests in Phoenix

Context

Always start the troubleshooting procedure by running the Phoenix self tests. If a test fails, please follow the diagram below.

If the phone is dead and you cannot perform the self tests, go to *Dead or jammed device troubleshooting.*

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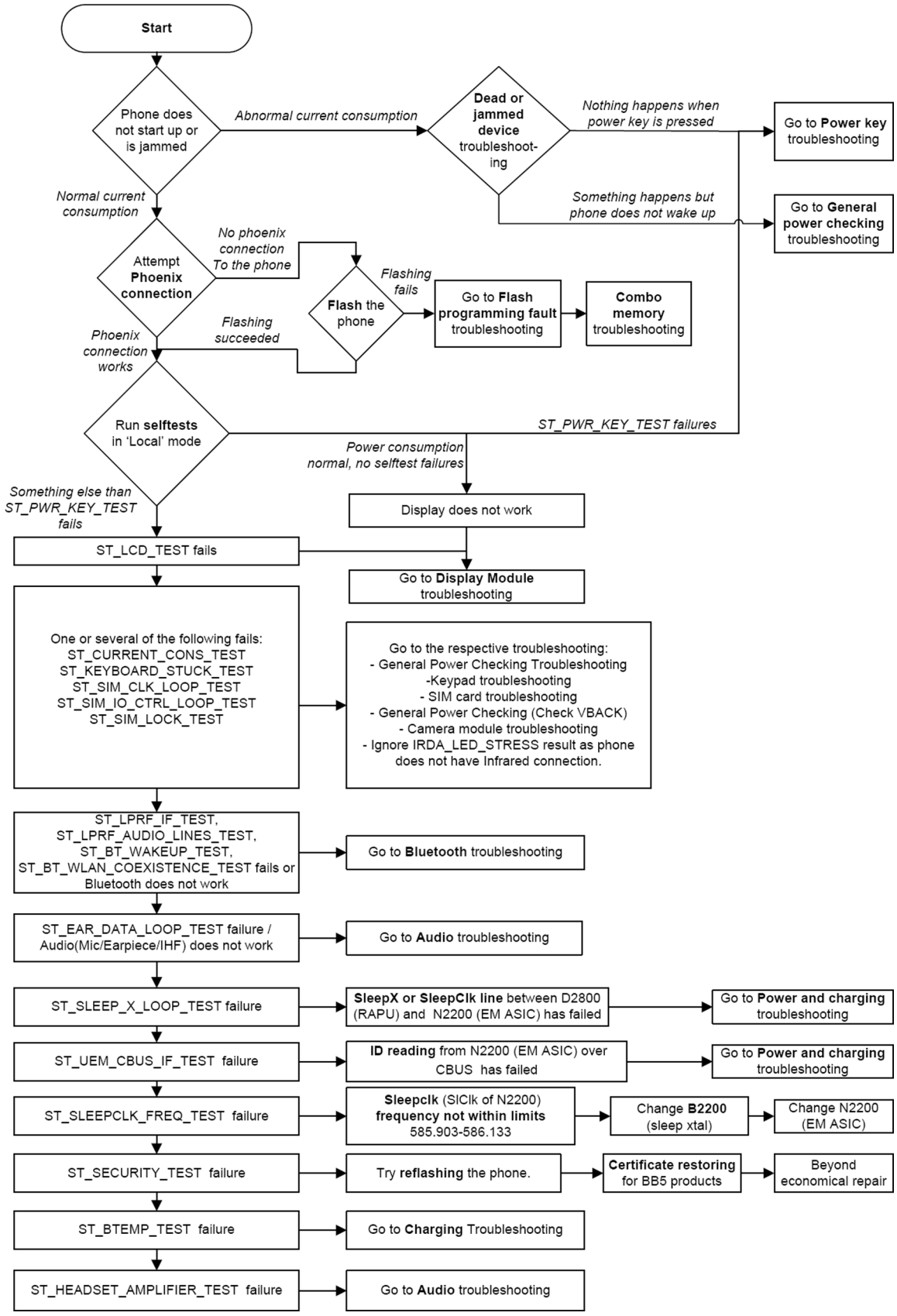
Troubleshooting flow



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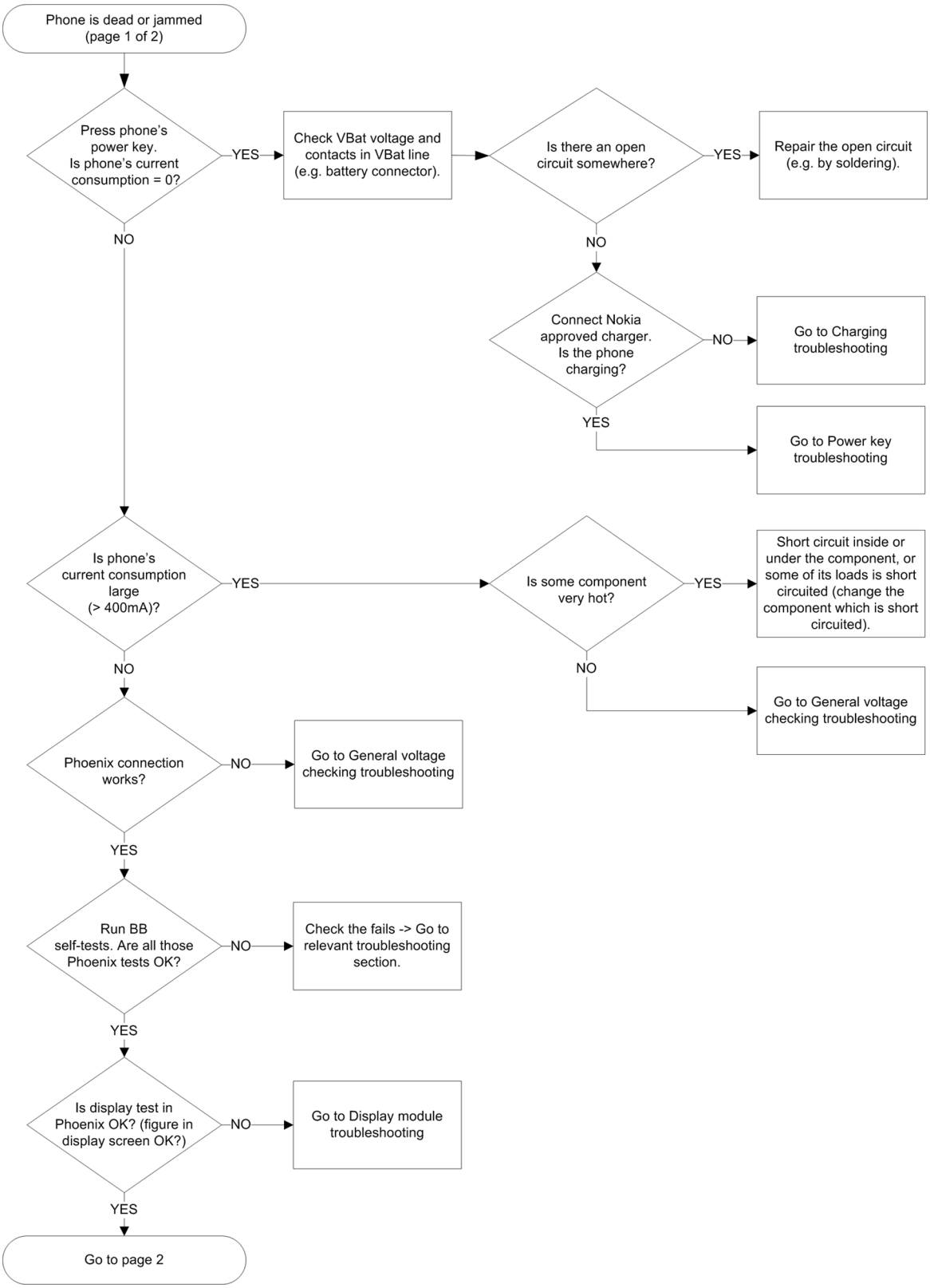
Power and charging troubleshooting

Dead or jammed device troubleshooting

Troubleshooting flow - Page 1 of 2



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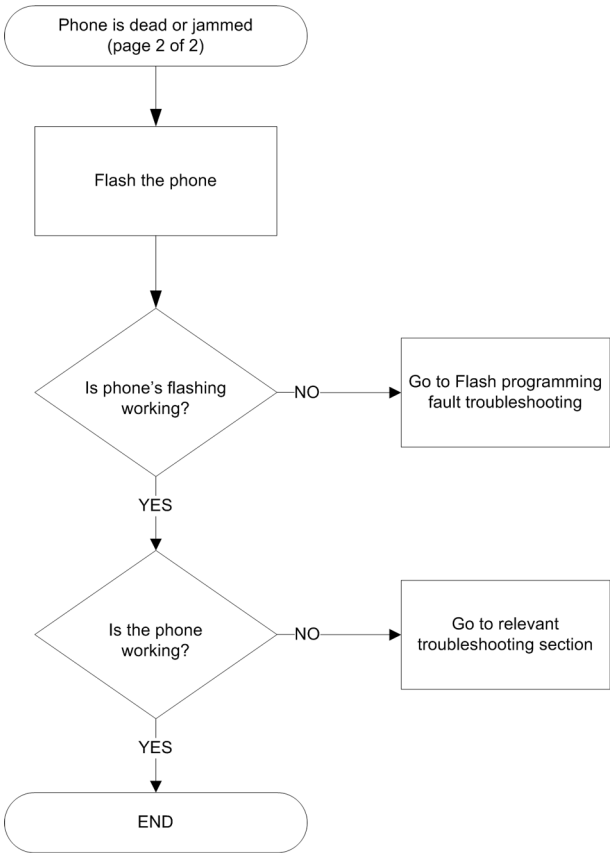
Troubleshooting flow - Page 2 of 2



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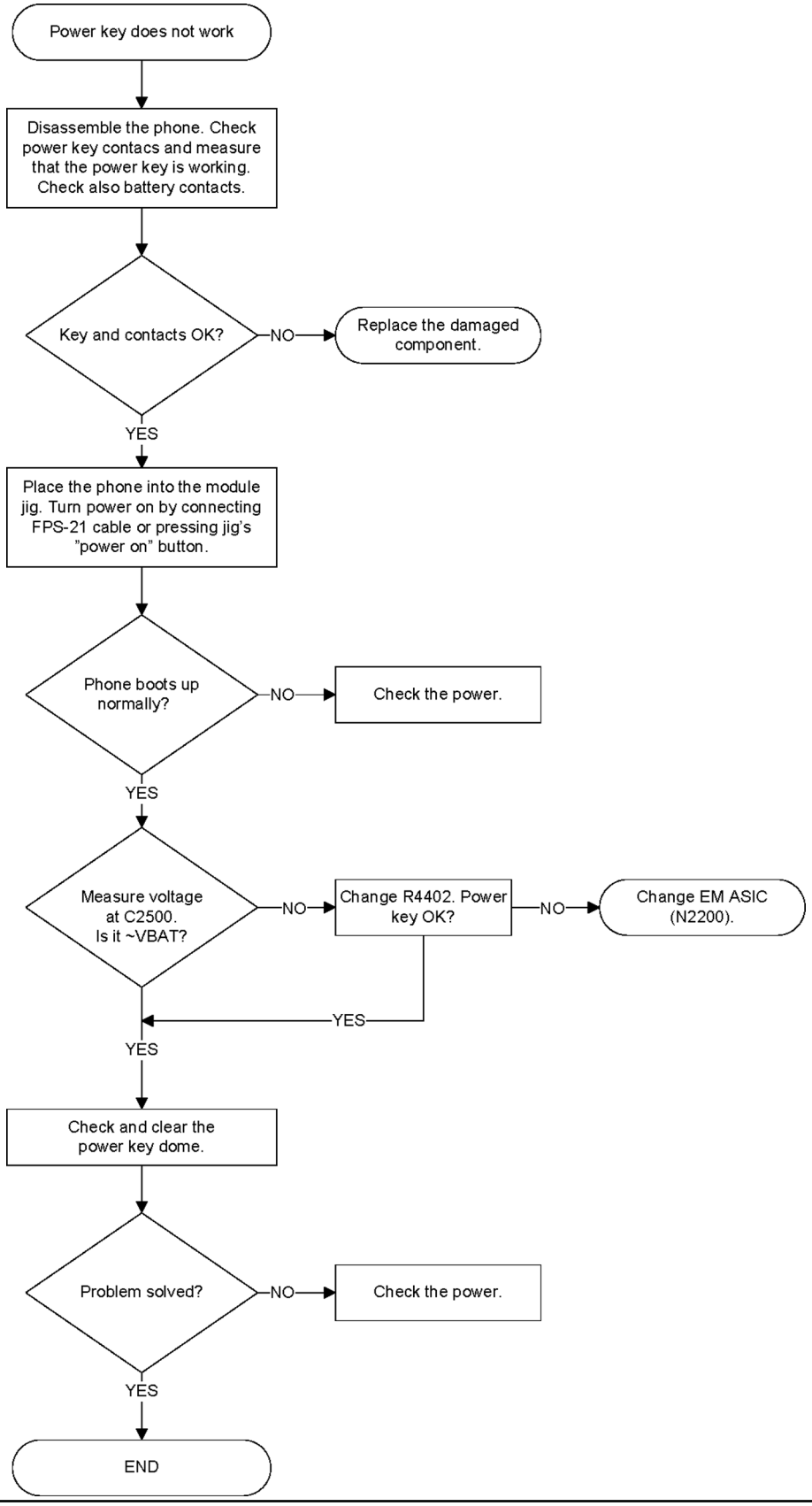
Power key troubleshooting

Troubleshooting flow



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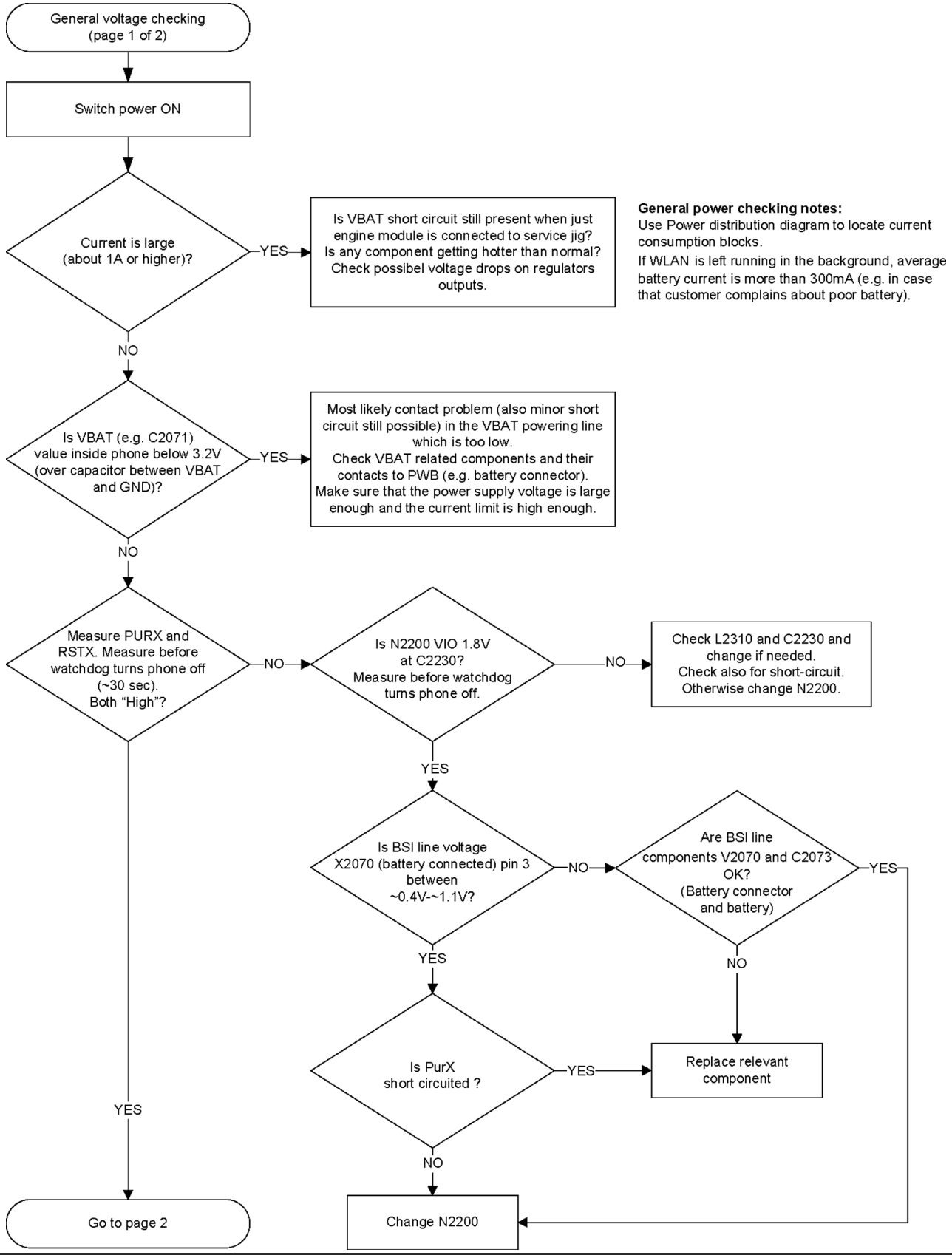
General voltage checking troubleshooting

Troubleshooting flow - Page 1 of 2



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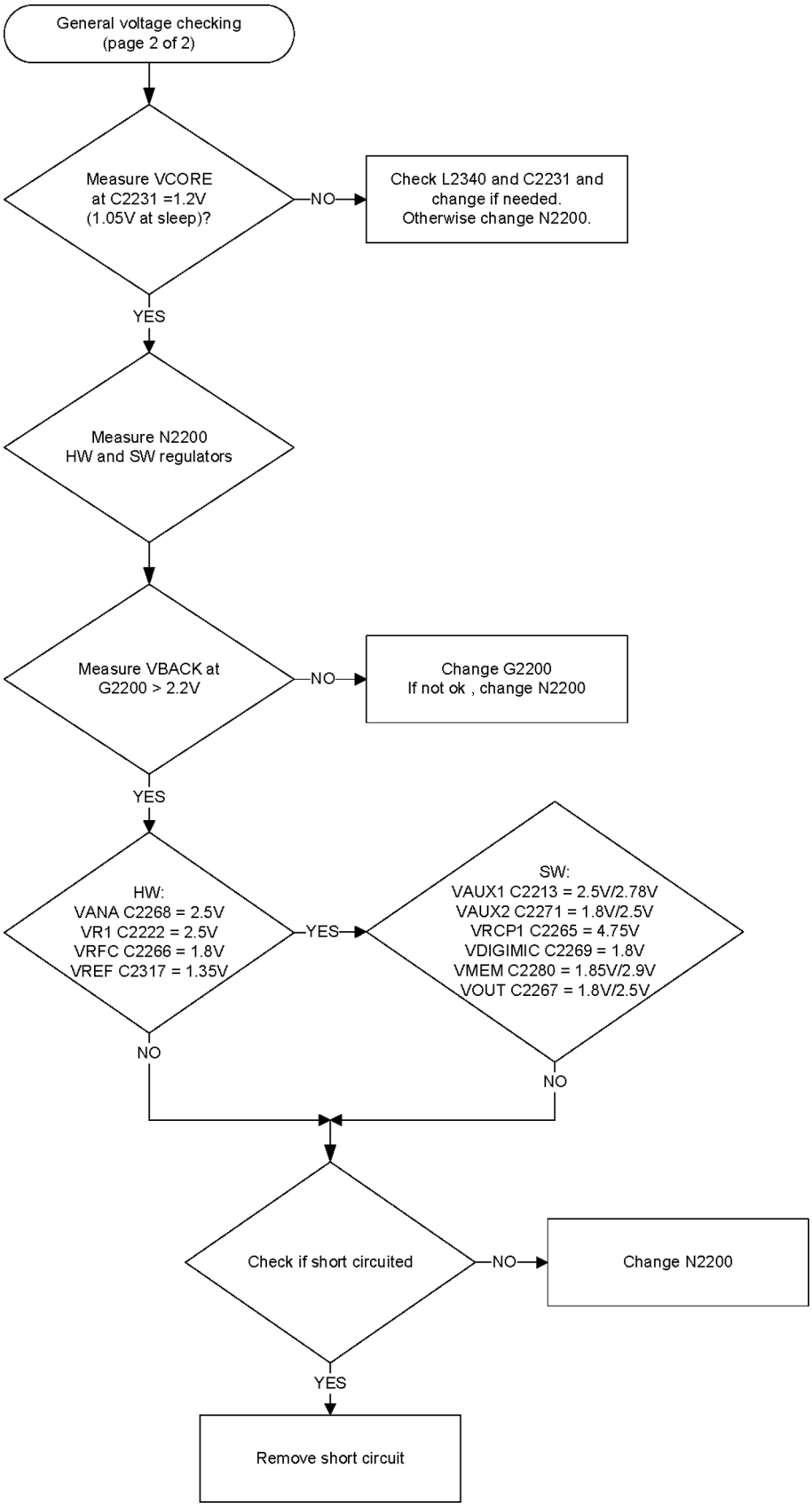
Troubleshooting flow - Page 2 of 2



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General power checking

Check the following voltages:

Signal Rename	Regulator	Sleep	Idle	Nominal voltage	Main user	Notes
VIO	Pearl/Gazoo	ON	ON	1.8	Memory, I/Os, Display	
VBACK	Pearl/Gazoo	ON	ON	2.5	Back-up battery	
VSIM1	Pearl/Gazoo	ON	ON	1.8/3.0	SIM card	
VAUX1	Pearl/Gazoo	ON	ON	2.8	TV-OUT, Display	
VAUX2	Pearl/Gazoo	OFF	OFF	2.5	ALS, accelerometer and magnetometer	
VANA	Pearl/Gazoo	ON	ON	2.5	Audio	
VR1	Pearl/Gazoo	OFF	ON	2.5	Crystal oscillators	
VRFC	Pearl/Gazoo	OFF	ON	1.8	RAPU converters	
VRCP1	Pearl/Gazoo			4.75	To RF parts	
VREF	Pearl/Gazoo	ON	ON	1.25	RF reference	
VCORE	Pearl/Gazoo	ON	ON	1.2	RAPU digital	Can change due to RAPU version & SW
VOUT	Pearl/Gazoo	OFF	OFF	2.5	Video switch	
VCAM_2V8	N1401	OFF	OFF	2.8	Camera	Disabled in sleep
VCAM_1V8	N1402	OFF	OFF	1.800	Camera	Disabled in sleep
VMEM	Pearl/Gazoo	OFF	OFF	2.9	microSD	Disabled in sleep

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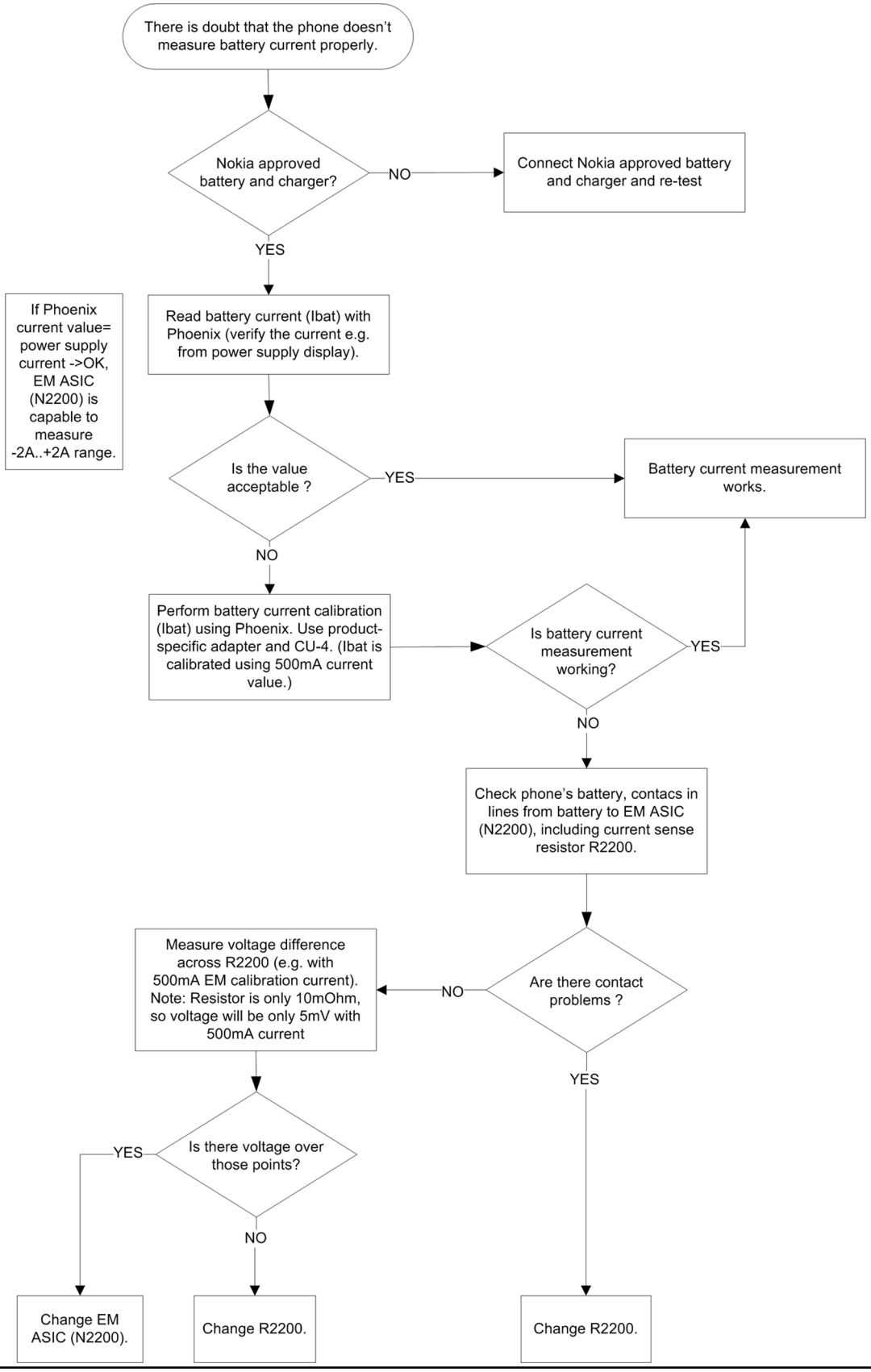
Battery current measuring fault troubleshooting

Troubleshooting flow



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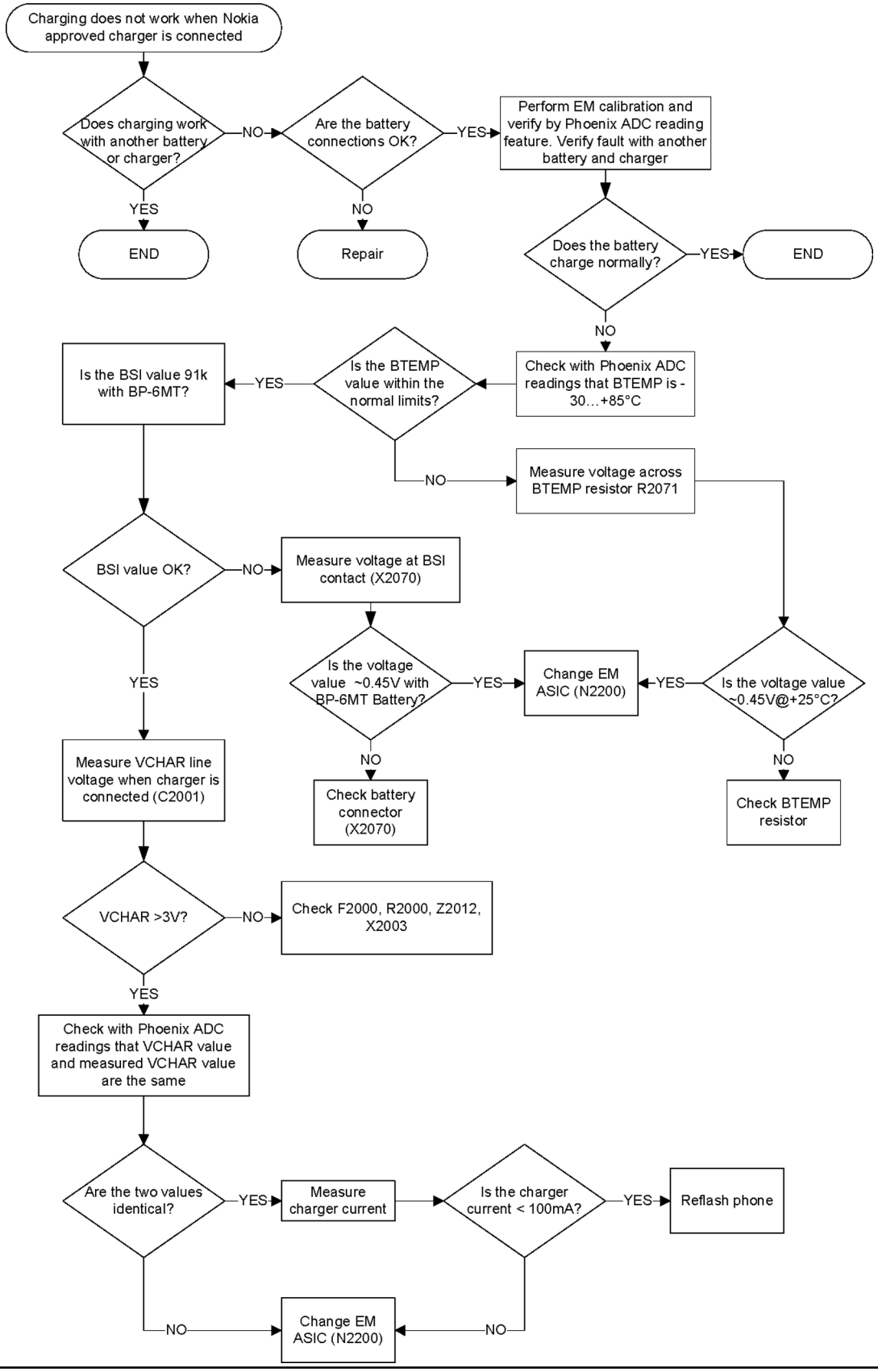
Charging troubleshooting

Troubleshooting flow



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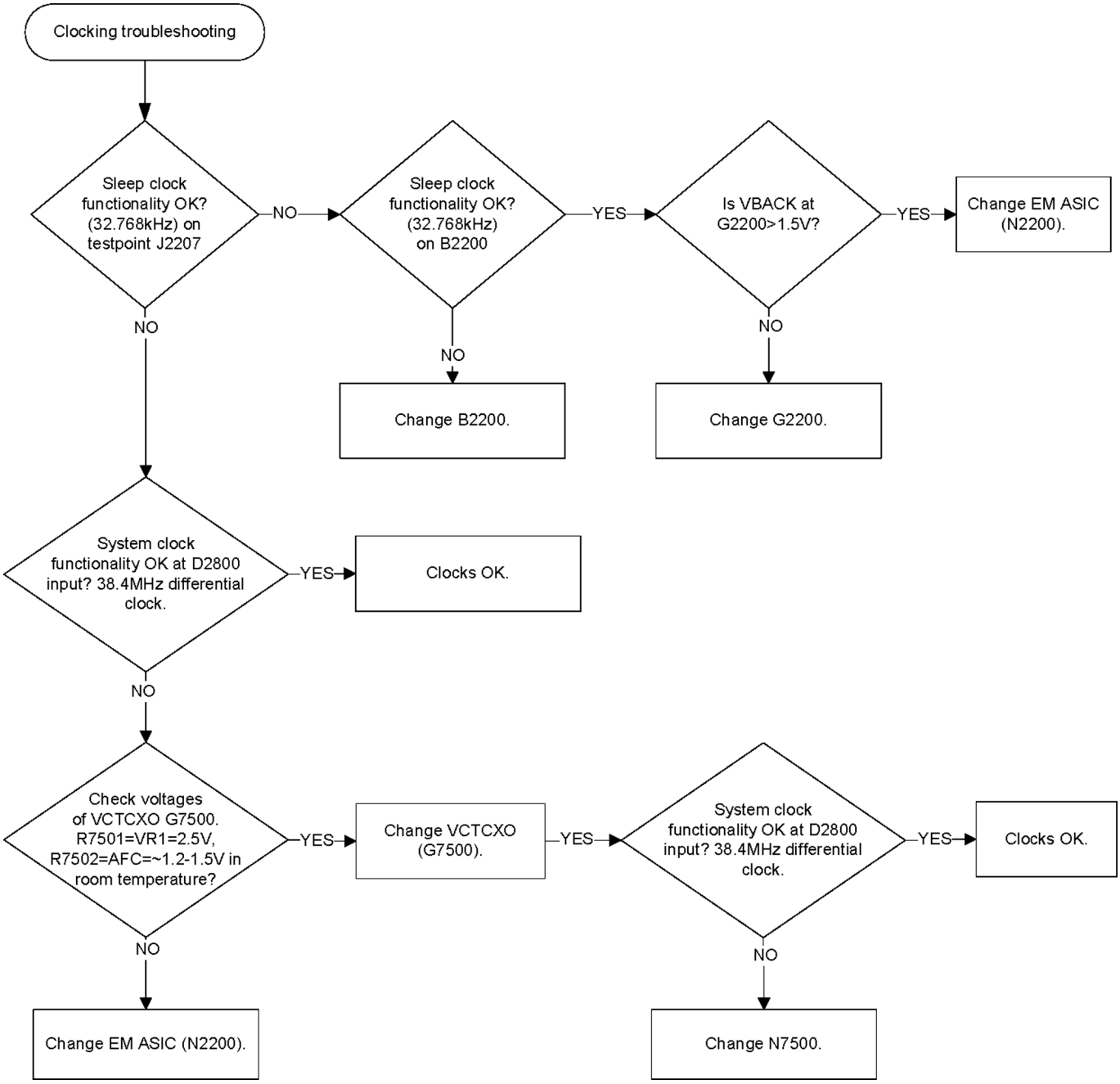
Clocking troubleshooting

Troubleshooting flow



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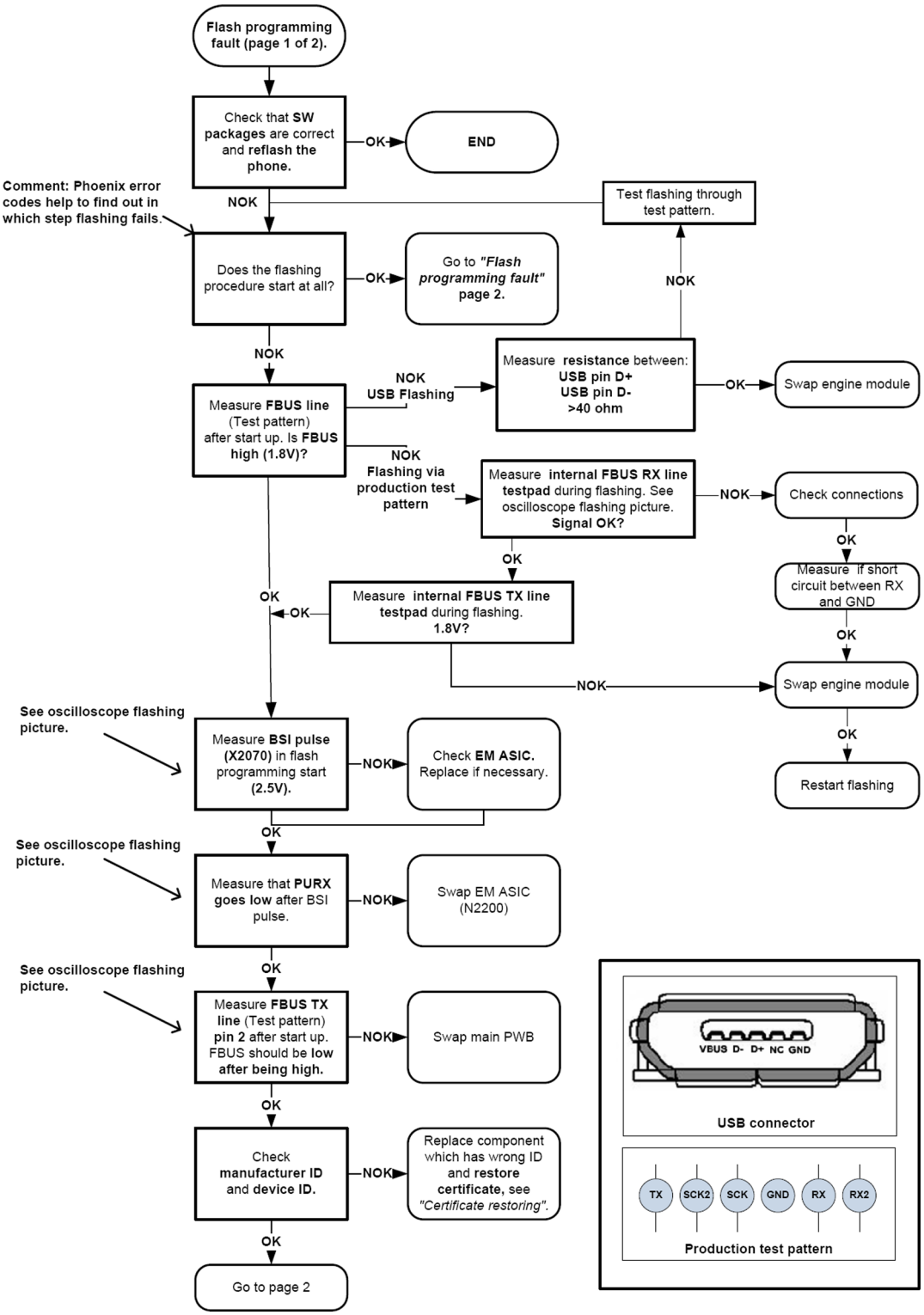
Interface troubleshooting

Flash programming fault troubleshooting

Troubleshooting flow - Page 1 of 2



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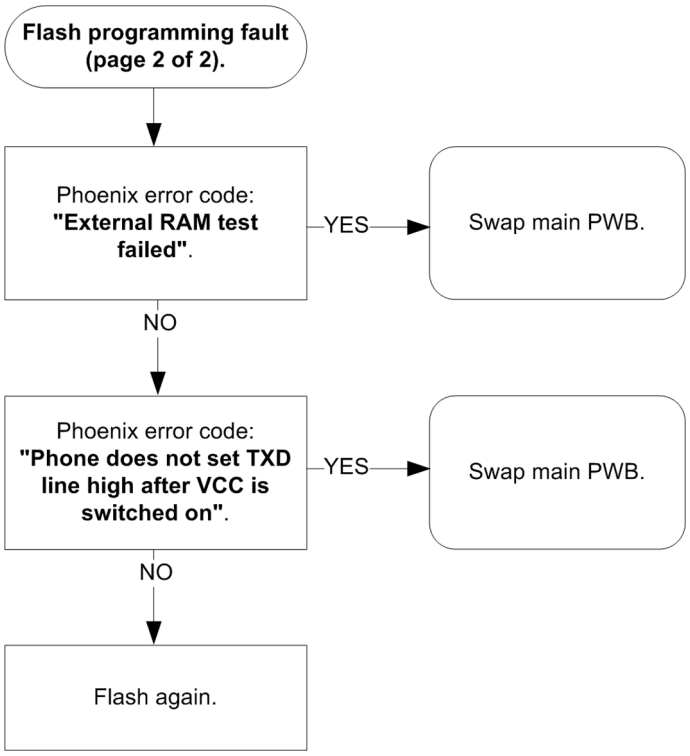
Troubleshooting flow - Page 2 of 2



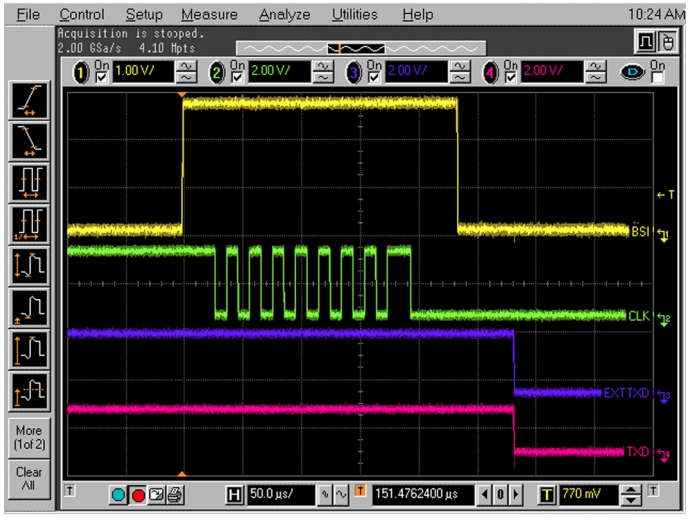


Figure 14 Flashing pic 1. Take single trig measurement for the rise of the BSI signal

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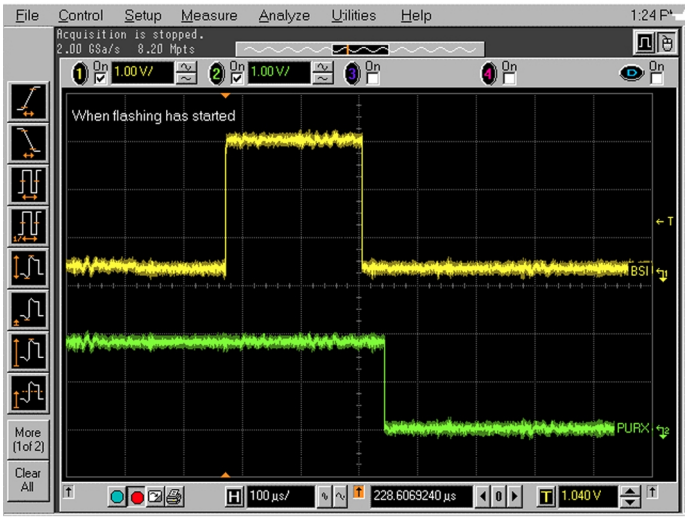

Figure 15 Flashing pic 2. Take single trig measurement for the rise of the BSI signal

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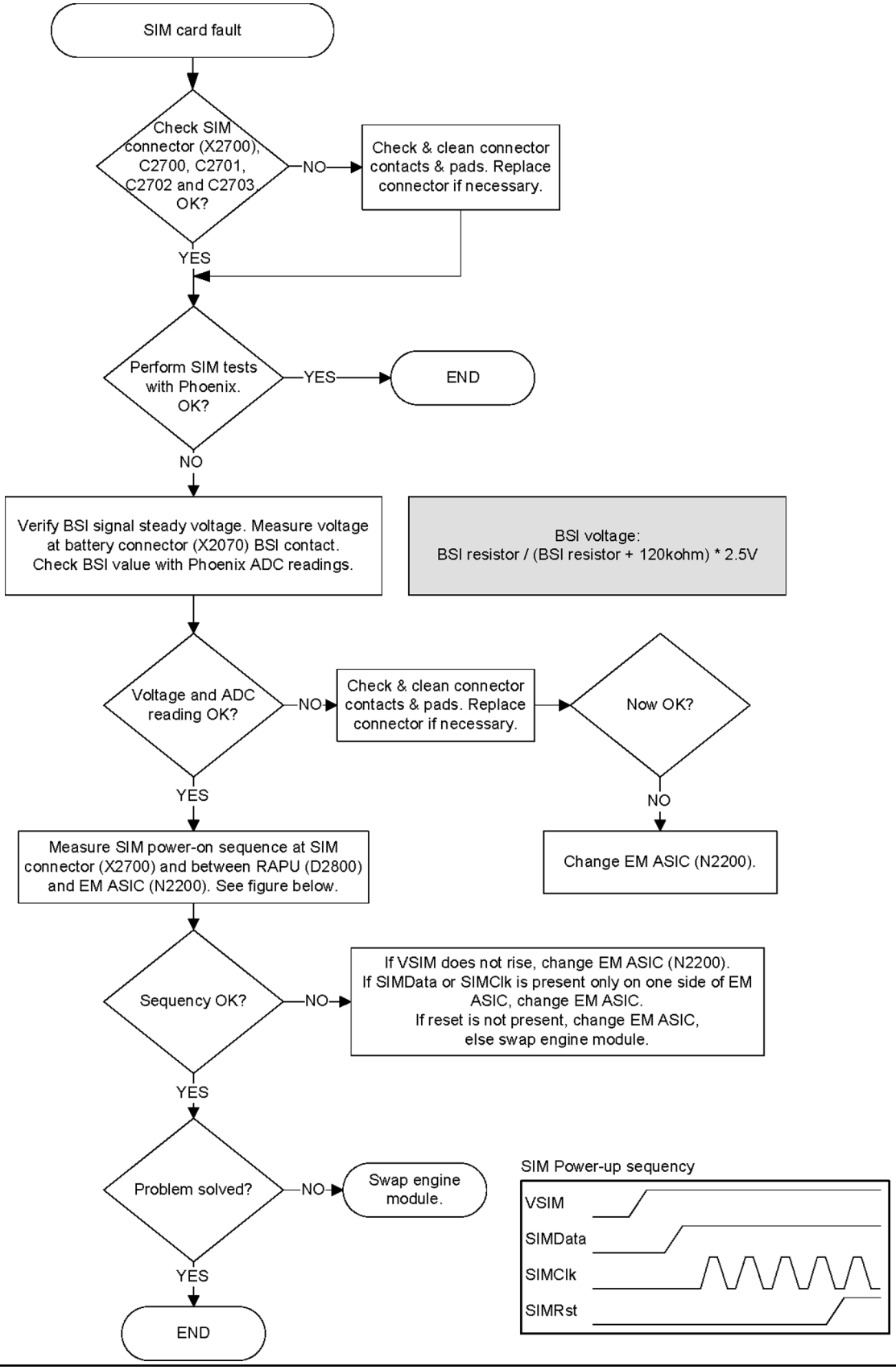
SIM card troubleshooting

Troubleshooting flow



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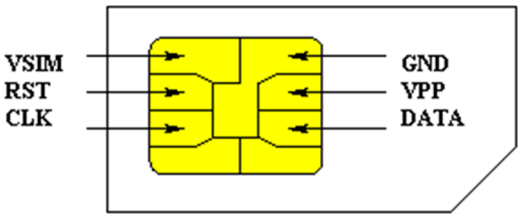
SIM power-on sequence

Testpoints between
RAPU and EM ASIC
J2218 = SIMData
J2219 = SIMClk
J2220 = SIMIOC

Fsimclk = 3.8MHz



SIM contacts

SIM power-on sequence on X2700.

SIM power-on sequence between RAPU and EM ASIC.

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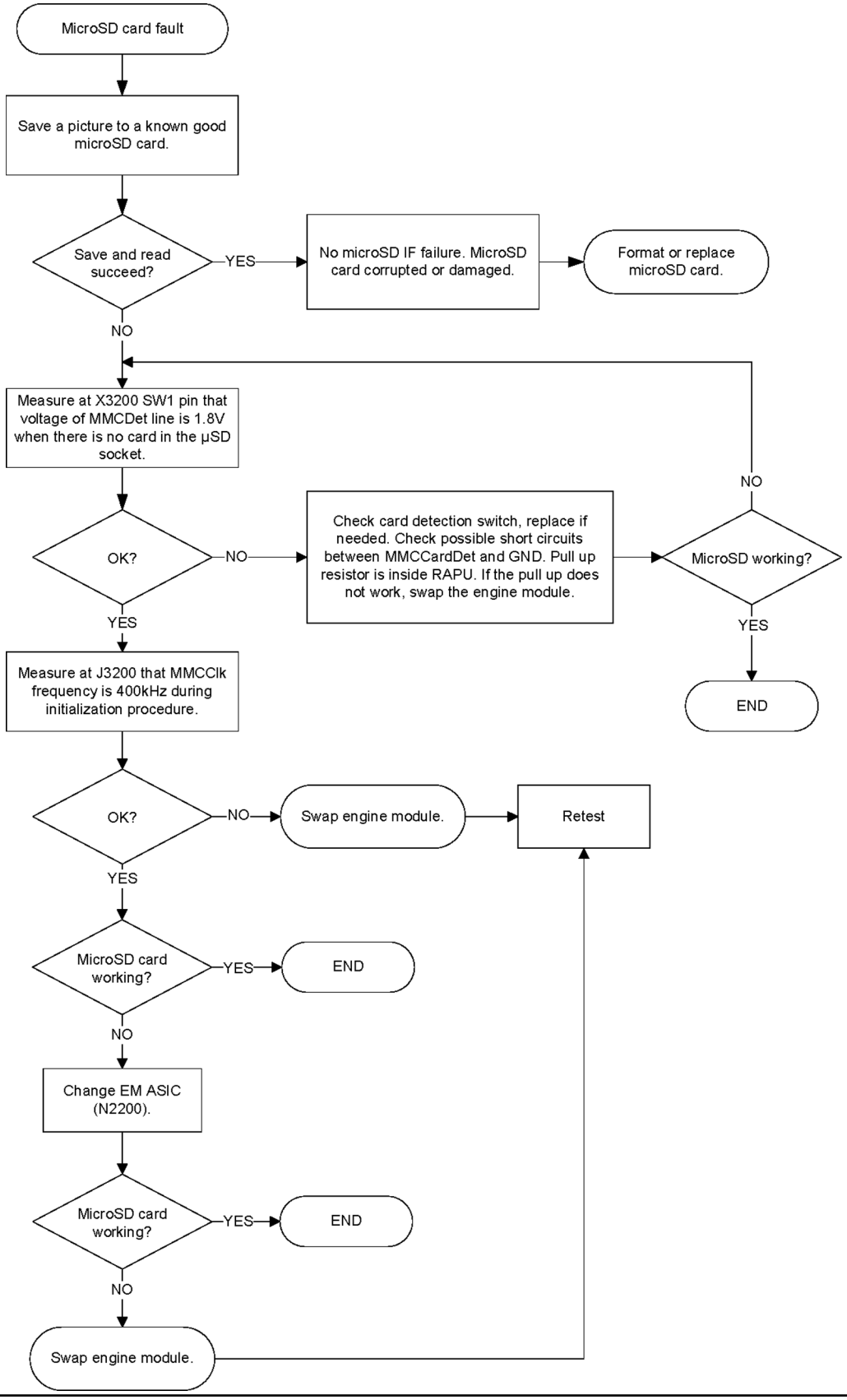
MicroSD card troubleshooting

Troubleshooting flow



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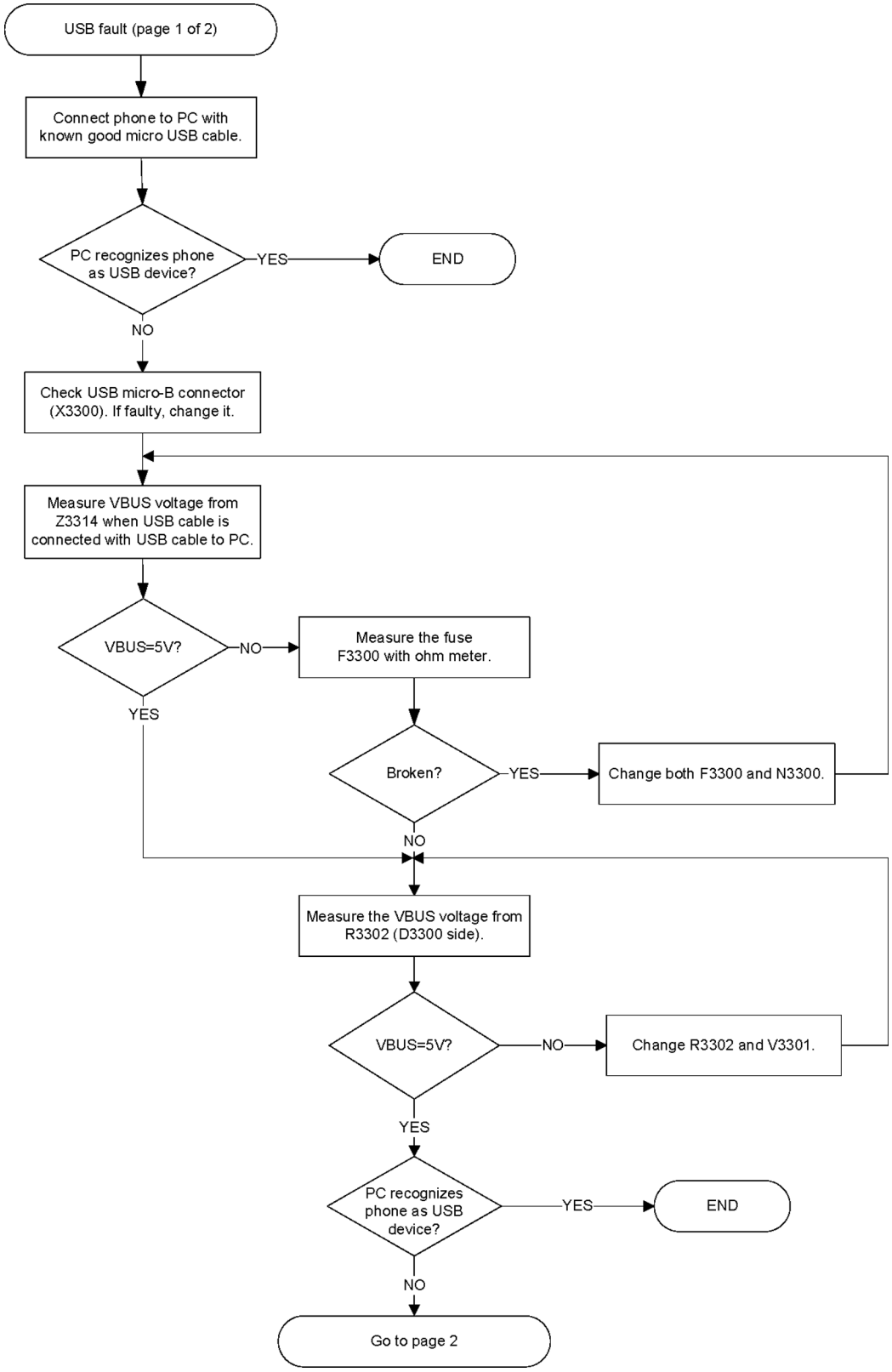
USB data interface troubleshooting

Troubleshooting flow - Page 1 of 2



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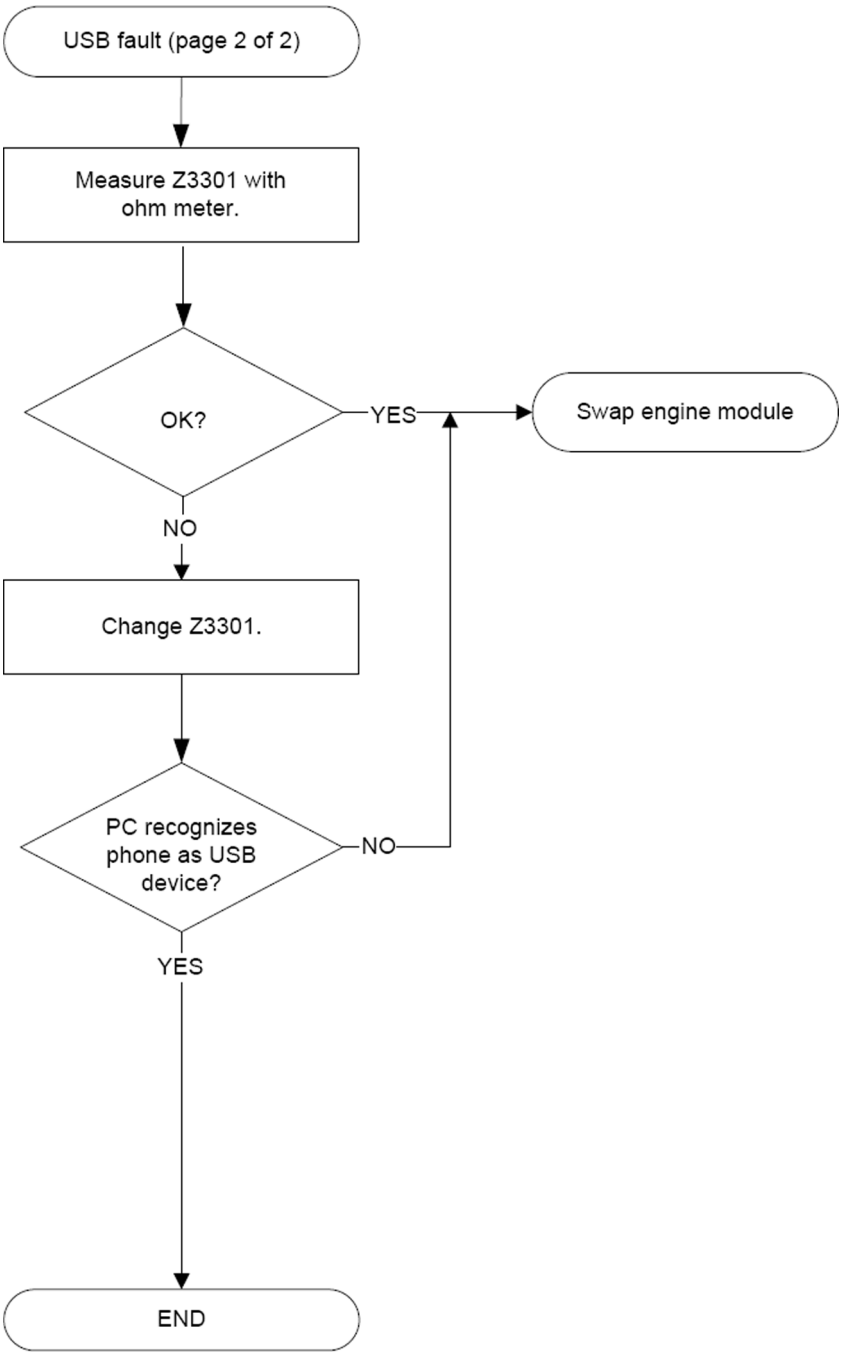
Troubleshooting flow - Page 2 of 2



TV-out troubleshooting

Context

A composite video monitor (TV) can be connected to a TV-out connector. The TV-out connection supports PAL and NTSC video standards. Video signal is connected to AV-connector pin 3.

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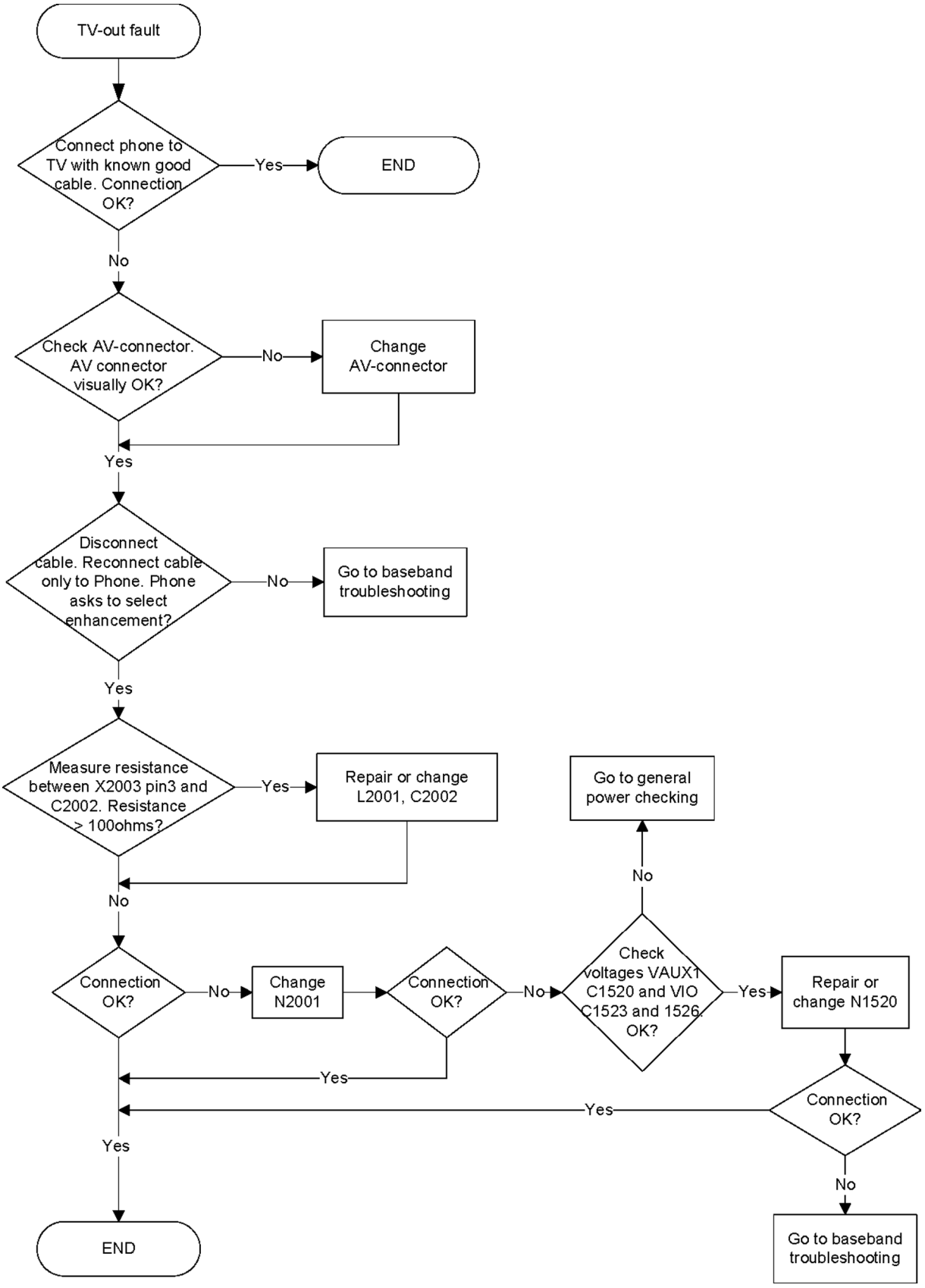
Troubleshooting flow



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User interface troubleshooting

Keyboard and side keys troubleshooting

Context

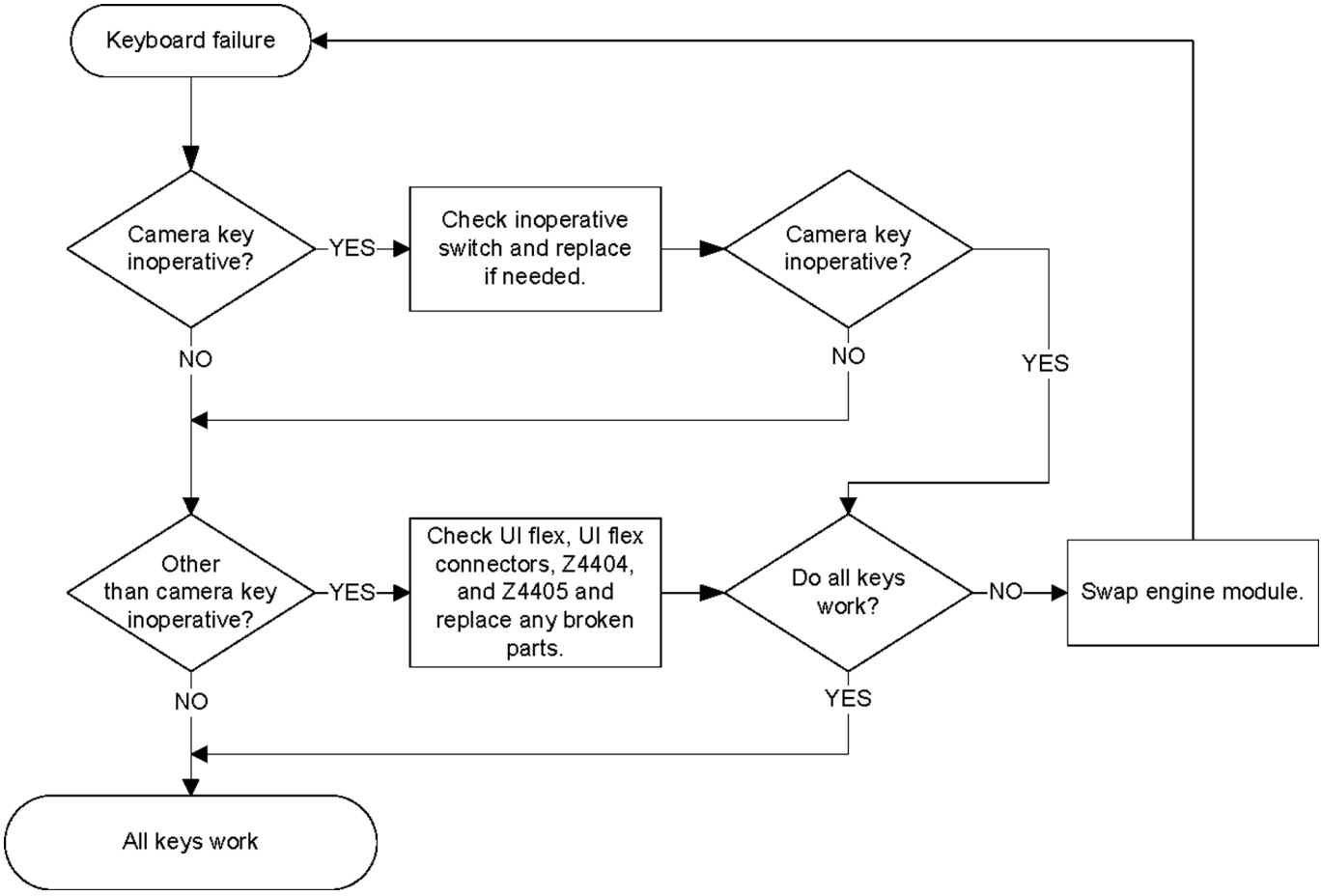
There are two possible failure modes in the keyboard module:

- One or more keys are stuck, so that the key does not react when a keydome or a side key is pressed. This kind of failure is caused by mechanical reasons (dirt, rust, mechanical damage, etc.)
- Malfunction of several keys at the same time. This happens when one or more rows or columns in the key matrix are failing (shortcut or open connection).

If the failure mode is not clear, start with the Keyboard test in Phoenix.

In this phone the keyboard is connected to D2800 I/O pins.

Troubleshooting flow



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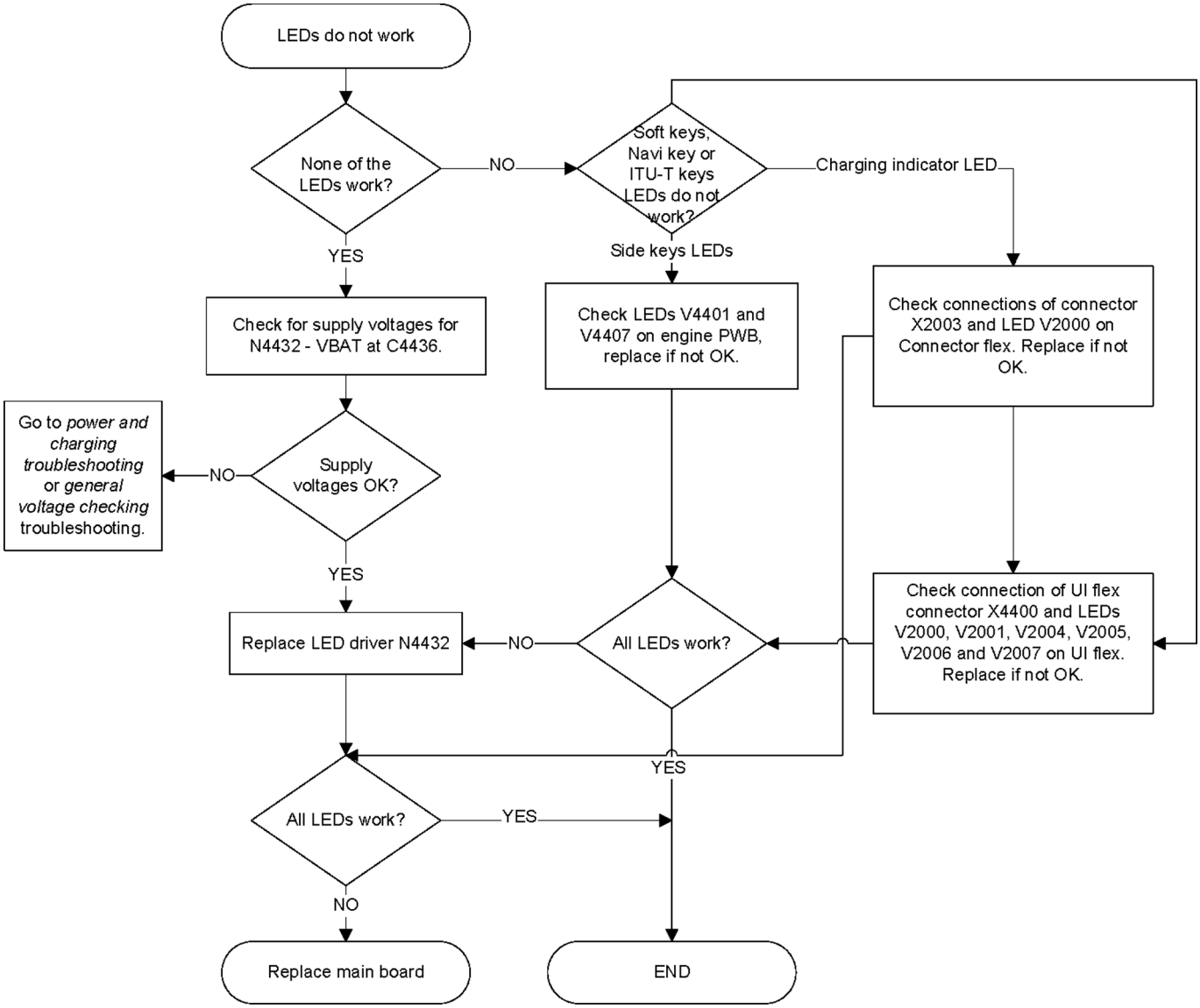
Keyboard, side keys and indicator LED troubleshooting

Troubleshooting flow



Display module troubleshooting

General instructions for display troubleshooting

Context

- The display is in a normal mode when the phone is in active use.
- The operating modes of the display can be controlled with the help of *Phoenix*.

Table 9 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.

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Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. • If a part of the image is missing, change the display module. • If the image is otherwise corrupted, follow the display fault troubleshooting flowchart.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. This means that in case the display is working (image OK), the backlight is faulty.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

Table 10 Pixel defects

Item		White dot defect				Black dot defect	Total
1	Defect counts	R	G	B	White Dot Total	1	1
		1	1	1	1		
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.					

Steps

1. Verify with a working display that the fault is not on the display module itself.
   The display module cannot be repaired.
2. Check that the cellular engine is working normally.
   i To check the functionality, connect the phone to a docking station.
   ii Start *Phoenix* service software.
   iii Read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).
3. Proceed to the display fault troubleshooting flowchart.
   Use the **Display Test** tool in *Phoenix* to find the detailed fault mode.

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Display fault troubleshooting

Context

The display module is an active matrix TFT panel including display controller.

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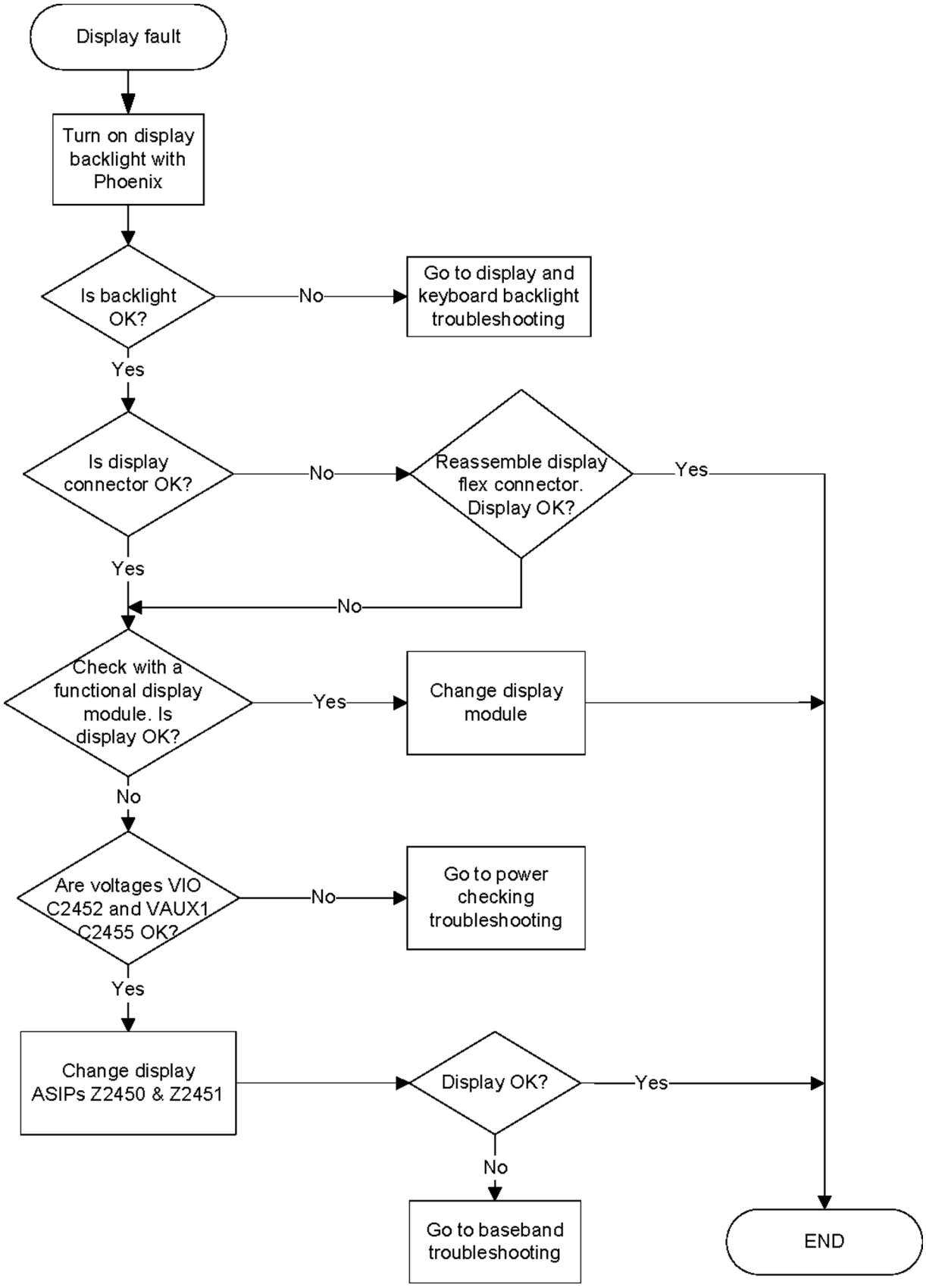
Troubleshooting flow



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Introduction to display and keyboard backlight troubleshooting

Display and keyboard lights are handled by Gazoo (EM ASIC) internal LED drive. It has one output pin, but two independent LED branches (display and keyboard) which can have different number of LEDs (2 to 4). Keyboard and display branch of LED network can be enabled and disabled independently from Gazoo LedCR register or using Phoenix display test program. Display LEDs are located inside the display and keyboard LEDs are on the PWB.

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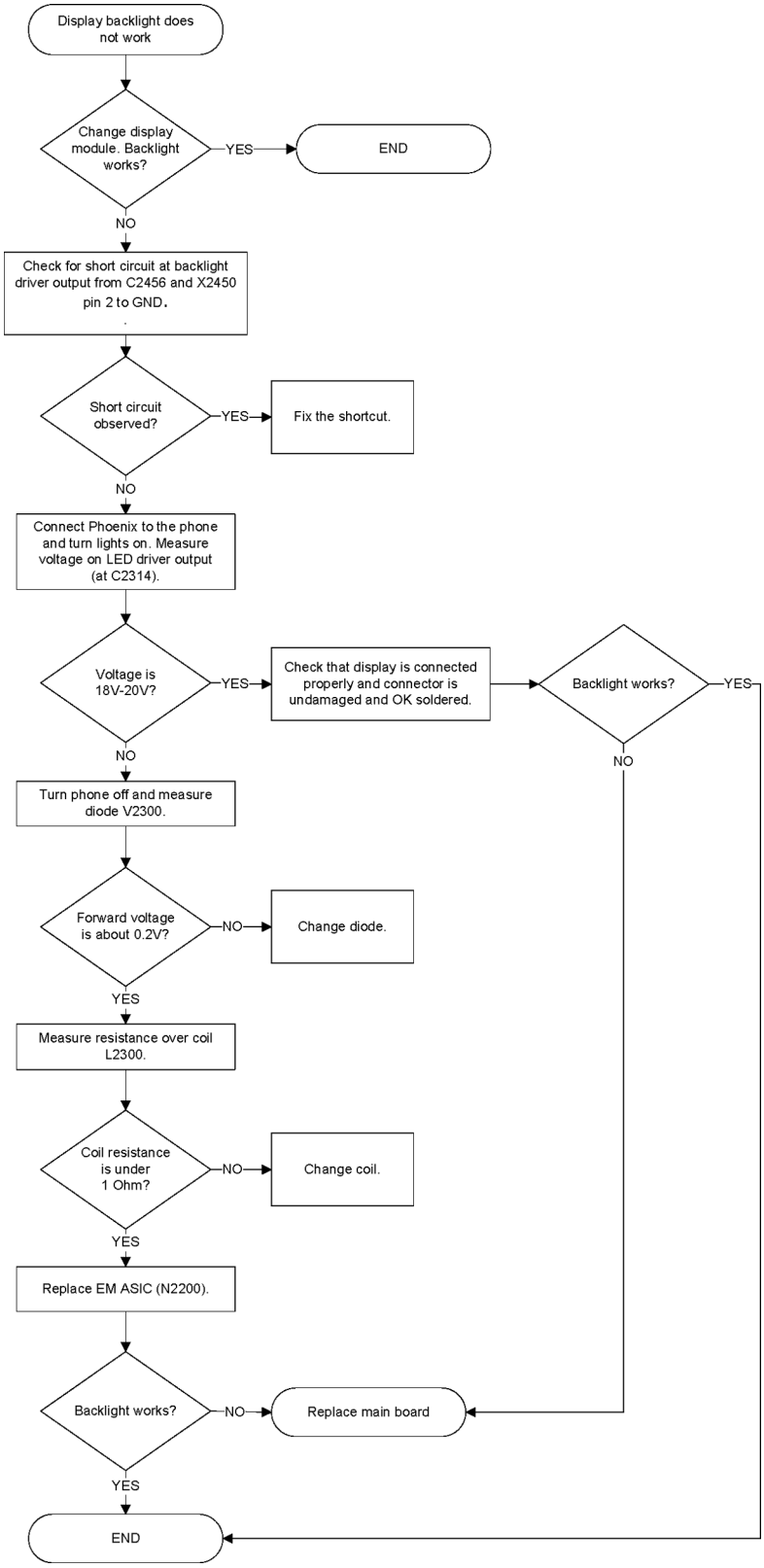
Display backlight troubleshooting

Troubleshooting flow



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Ambient Light Sensor troubleshooting and re-calibration

Introduction to ALS troubleshooting and re-calibration

The Ambient Light Sensor (ALS) consists of the following components:

- Ambient Light Sensor (N1100). ALS is a digital I2C interface component that has two channels with different spectral sensitivities. When combined, the component responds to illuminance similar as human eye.
- Vdd filtering capacitor (C1100)

The ALS components are located at the top side of the main PWB as illustrated in the figure below.

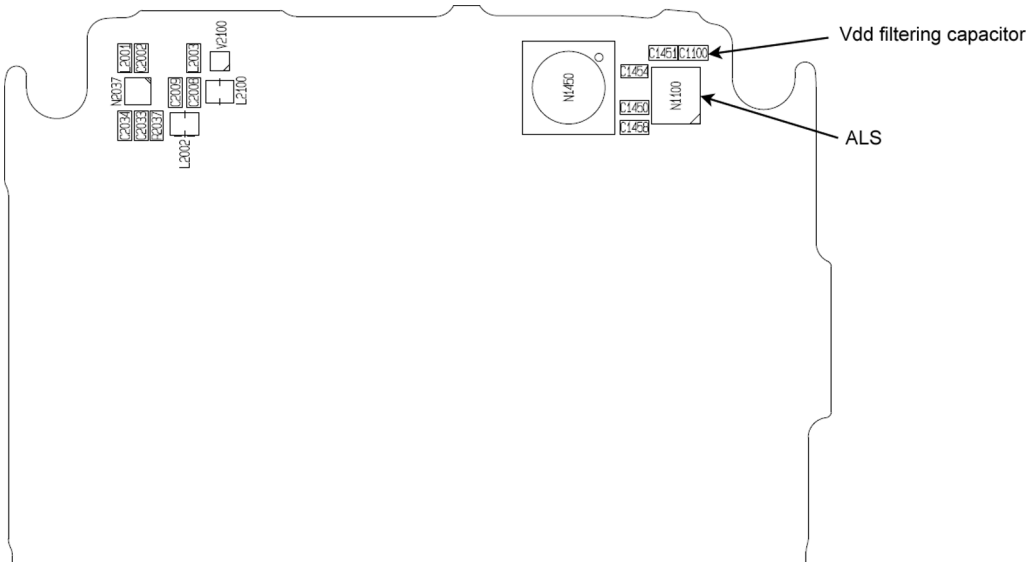

Figure 16 ALS components

ALS information is used to control the keypad and display brightness of the phone. The keyboard backlight is turned OFF, when it is not needed. Display brightness is dimmed, when environment lighting is dark. ALS is calibrated in production and can be re-tuned in service points though not recommended unless calibration coefficient is lost for some reason.

> **Note:** ALS calibration is also required for Light SWAP Engines, because ALS is not factory calibrated for Light SWAP.

When executing the ALS calibration, a reference phone that includes calibrated ALS is required. The ALS re-tuning instructions show why the reference phone is needed.

> **Note:** Make sure that you have completed the display and keyboard backlights troubleshooting before starting the ALS troubleshooting.

There is an Ambient Light Sensor window in the Phoenix Display Test tool, which shows the luminance value. The correct luminance in darkness is <20 lx, and in an office environment 100-2000 lx.

> **Note:** The luminance value depends heavily on the light source and the angle of the phone against the light source, so the values above can only be used as a rough guideline. Phoenix has an ambient light sensor calibration tool for changing the calibration values.

Functionality check

Steps

1. Connect the phone to *Phoenix*, start the *Phoenix* software, and set the phone (e.g. on the table) so that the ambient light visible to ALS is stable. The light quide of the ALS is located on the upper part of the phone's front cover, right next to the secondary camera.

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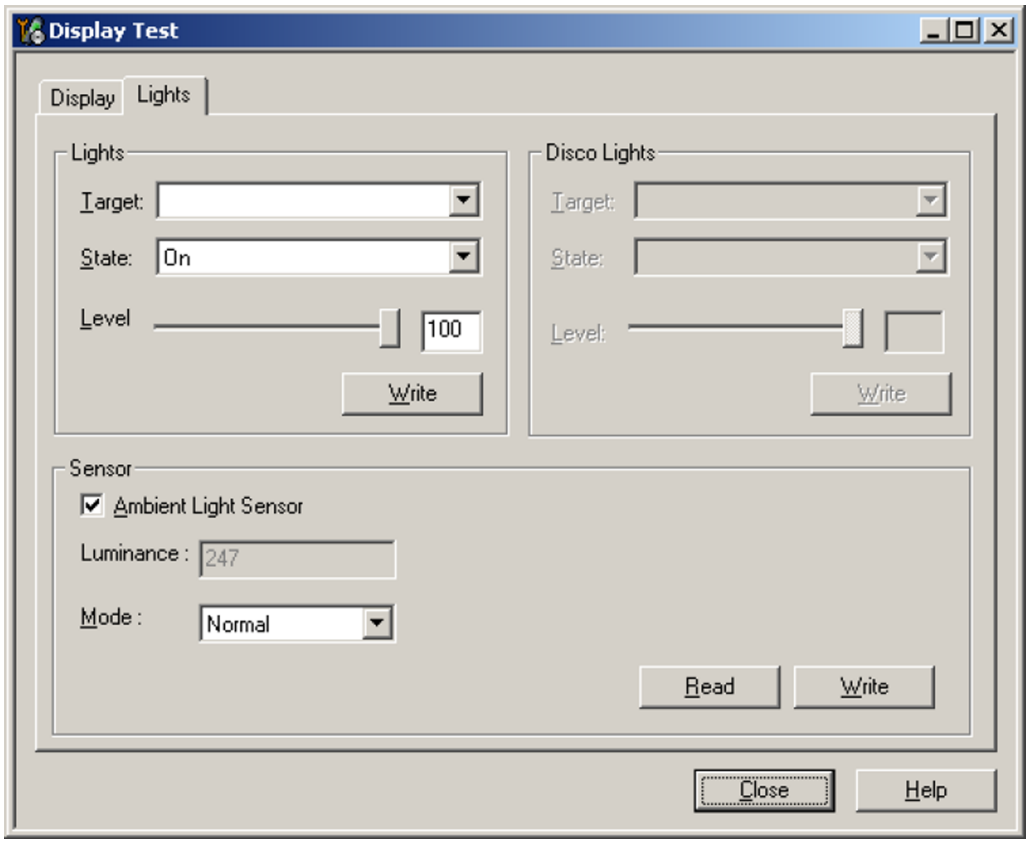
2. Scan product on Phoenix (**CTRL+R**)
3. Choose **Testing→Display test.**



4. Open the **Lights** tab, and check the Ambient light sensor check box. Click the **Read** button in order to get the reference ambient light value. Cover the sensor and click **Read** again. When covered, the luminance reading should be less than after clicking **Read** without covering the sensor.
5. If the component does not give any reading or the reading does not change when sensor is/is not covered, replace the part.

   Note: The ALS calibration procedure requires a reference phone with a calibrated ALS.

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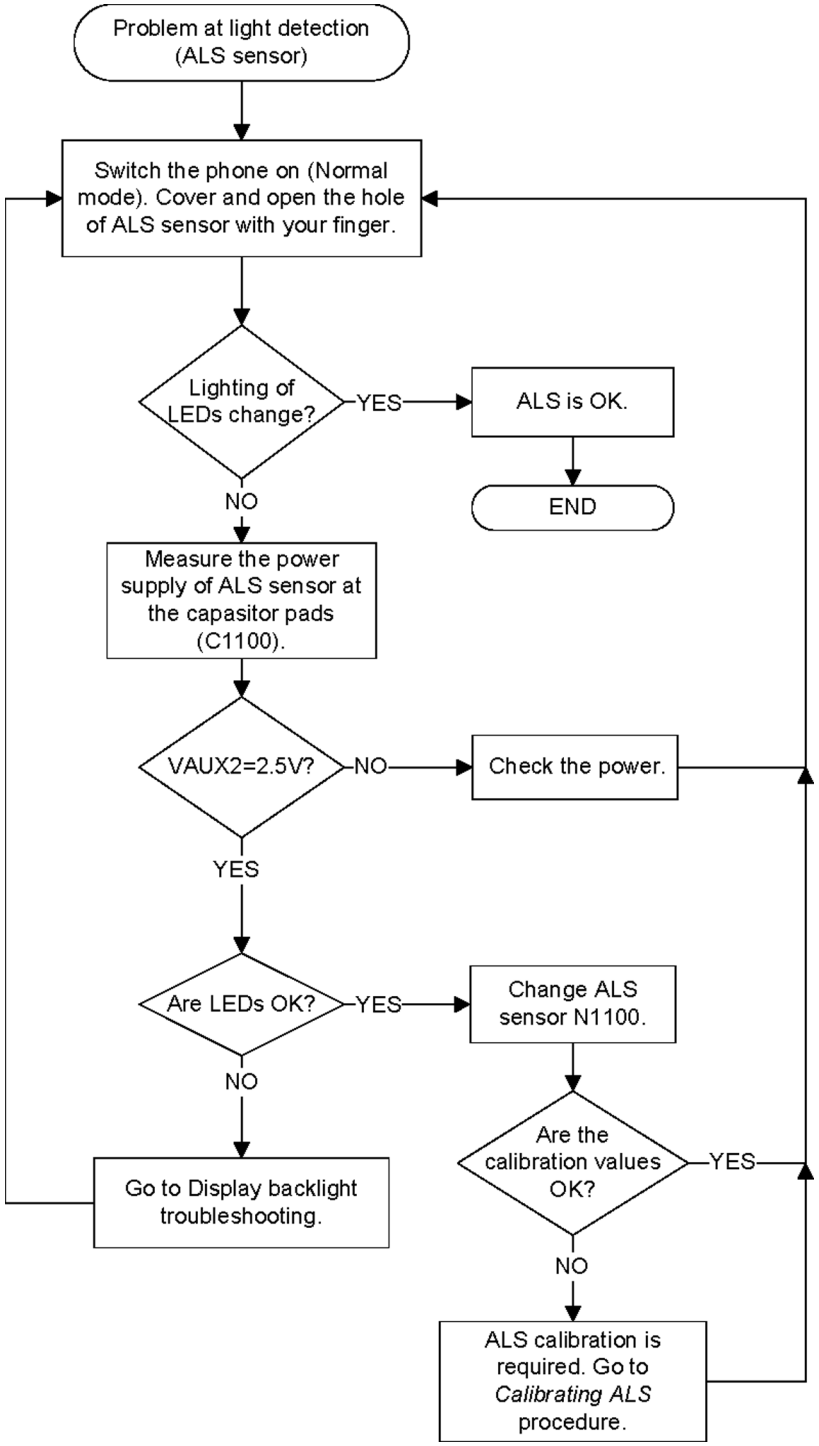
ALS troubleshooting

Troubleshooting flow



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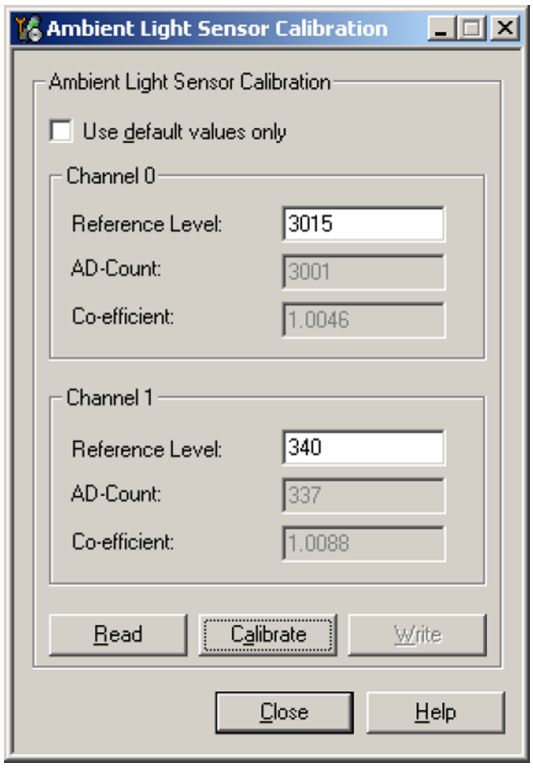
Calibrating ALS

Steps

1. Connect the phone to *Phoenix*, start the *Phoenix* software, and set the phone (e.g. on the table) so that the ambient light visible to ALS is stable. The light quide of the ALS is located on the upper part of the phone's front cover, right next to the secondary camera.
2. Scan product on Phoenix (**CTRL+R**)
3. Choose **Testing→Ambient Light Sensor Calibration.**



4. Uncheck the Use default values only check box, click the **Read** button to get the AD-Count values for Channel 0 and Channel 1, and write them down.

   Note: In the example graphic the reference phone values are: Channel 0=3001 and Channel 1=337
5. Repeat steps 1-4 for the phone to be calibrated.

   Note: Make sure the phone to be calibrated is located in the same place as the reference phone was when luminance reading was taken.
6. Calculate and write down co-efficient value by division:

$$\textbf{Co-efficient(CH0)}=\frac{Channel(0)_{(ref.phone)}}{Channel(0)} \quad \textbf{Co-efficient(CH1)}=\frac{Channel(1)_{(ref.phone)}}{Channel(1)}$$

7. To calibrate ALS, the value in the **Reference Level** textbox needs to be adjusted for both channels until the **Co-efficient** calculated by Phoenix equals the values calculated in step 6. Click **Calibrate** after each try (and uncheck the Use default values only check box).
8. Calibration is done when the **Co-efficient** is equal to the co-efficient value calculated in step 6.

   Note: Decimal numbers should be used in the iteration to achieve adequate precision (e.g. 200.2455)

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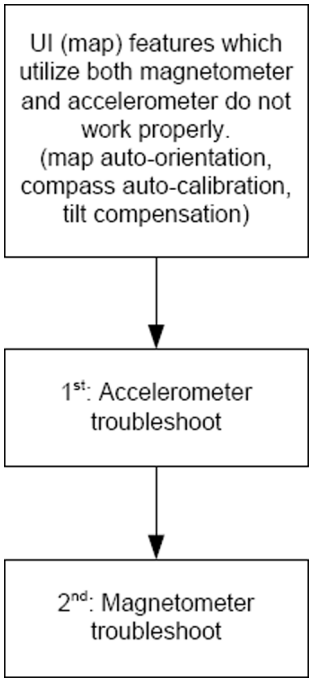
9. Use Phoenix (**Testing→Display test→Lights** tab) to verify the calibration by reading the luminance value for both the reference phone and calibrated phone.

   Note: Remember that the illuminance readings for the reference and calibrated phones must be done in the same ambient light conditions. If the illuminance values differ more than +- 10%, repeat the whole ALS calibration procedure.

10. To end the calibration, click Close.

Accelerometer and magnetometer troubleshooting

UI (map) features troubleshooting



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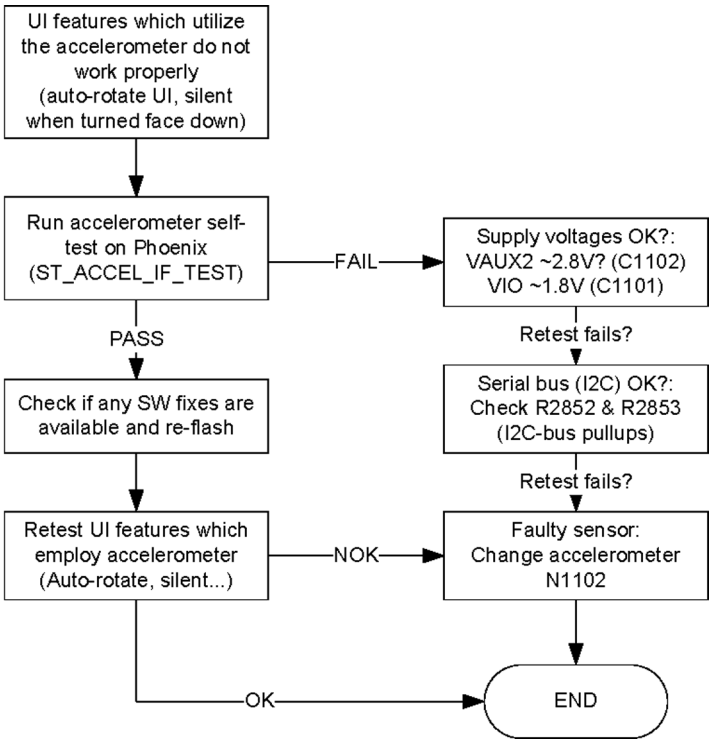
Accelerometer troubleshooting

Accelerometer self-test: (ST_ACCEL_IF_TEST) verifies the digital parts and the sensor elements inside the component. Self-test is available in LOCAL and TEST modes.

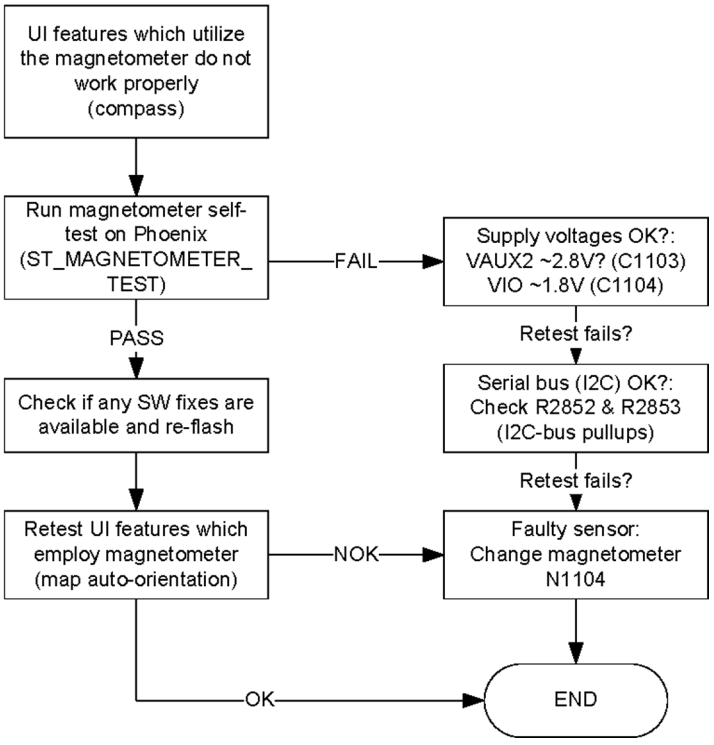
Note! The device needs to be stable when running the self-test to get correct results. If changes in acceleration are detected by the component during the test, it may cause the self-test to fail.



Magnetometer troubleshooting

Magnetometer self-test: (ST_MAGNETOMETER_TEST) verifies the digital parts and the sensor elements inside the component. Self-test is available in LOCAL and TEST modes.

Note! The device needs to be away from external magnets when running the self-test to get correct results. If the test is run when the device is within a magnetic field, it may cause the self-test to fail.



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GPS troubleshooting

GPS antenna

The GPS antenna is located on the A-side at the top of the phone.

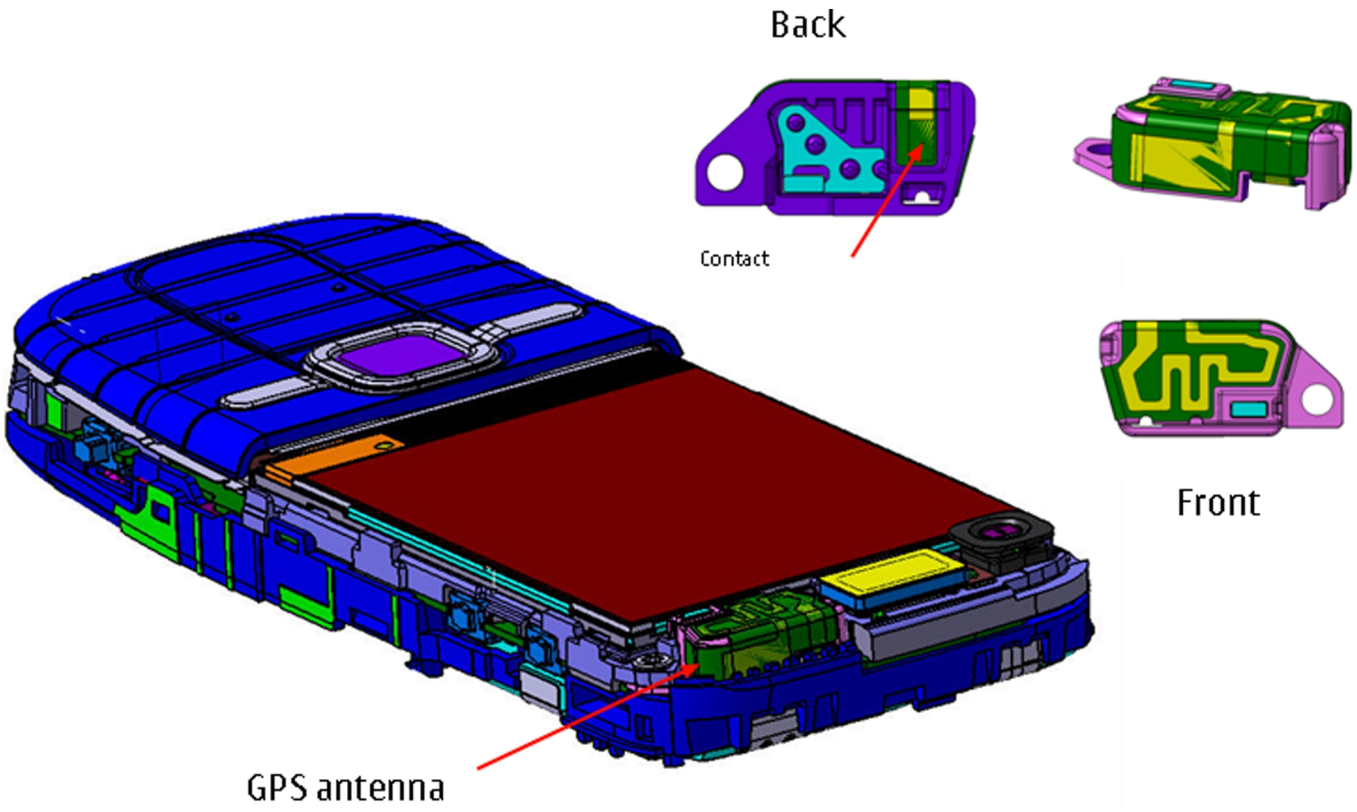

Figure 17 GPS antenna

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GPS layout and basic test points

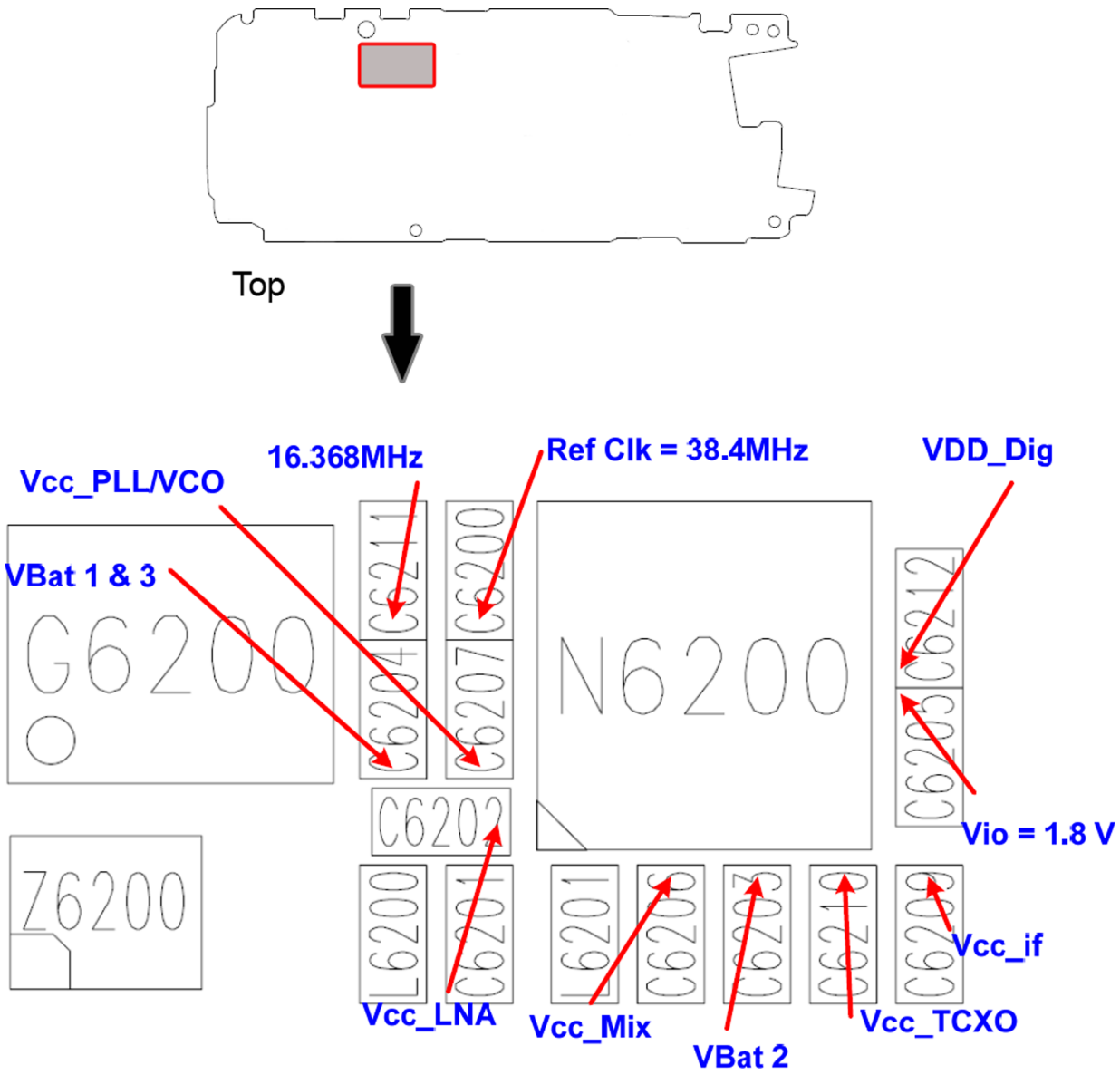

Figure 18 GPS layout and basic test points

VBat, ASIC internal LDO voltages, and clocks are available as shown in figure above. In addition to these, the following GPS signal is available on the test points listed below:

- GPS_En_Reset (J6201)

GPS RF test points

The GPS antenna test pads are located on the top side as shown in figure "GPS antenna test pads". Checking for a connection between these two test points will confirm that the antenna is working correctly, as will performing a radiated CW test.

J6210 = GPS Ant

J6211 = GPS Ant Gnd

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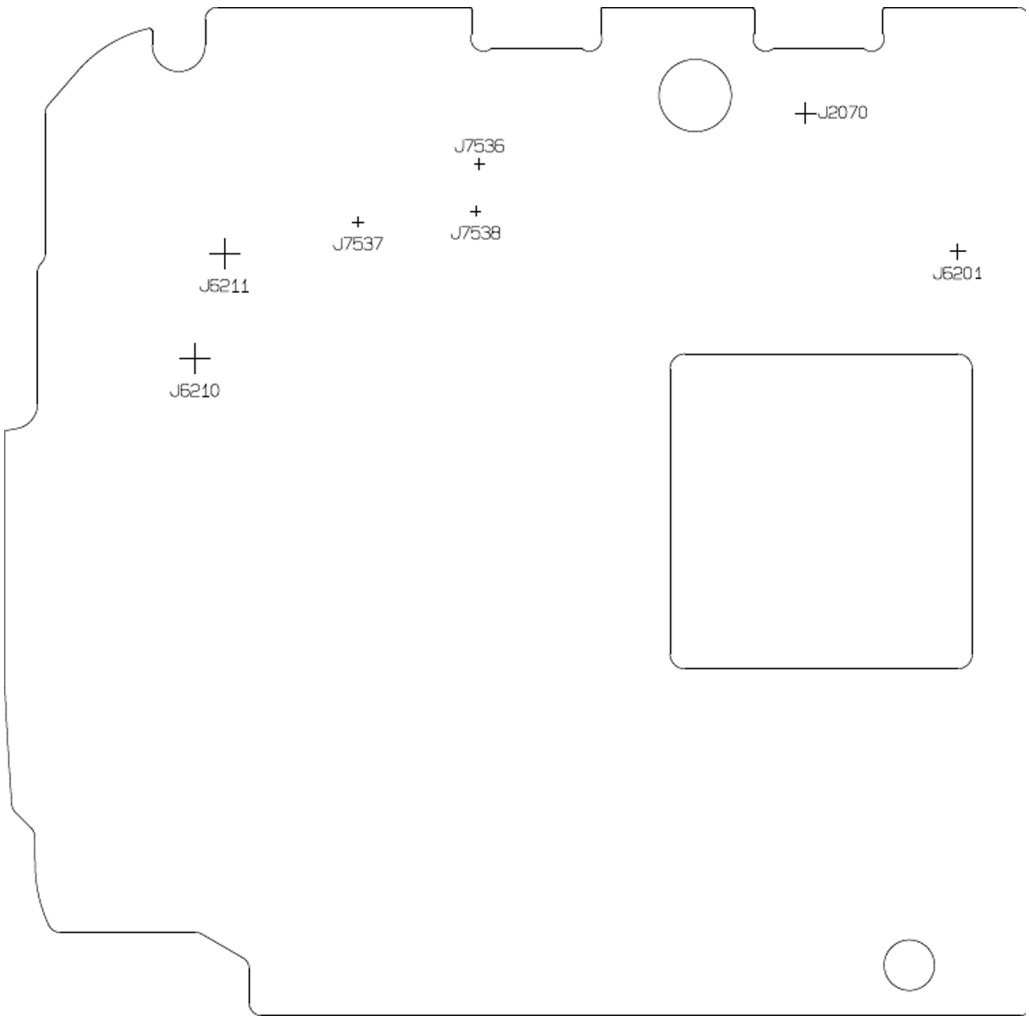

Figure 19 GPS antenna test pads, top side

In order to probe GPS RF test points, inject 1575.52 MHz tone @ -50dBm at the GPS antenna test connector and select **Receiver On**, then probe the GPS RF test points as shown in the figure below. Compare RF levels with a known reference phone.

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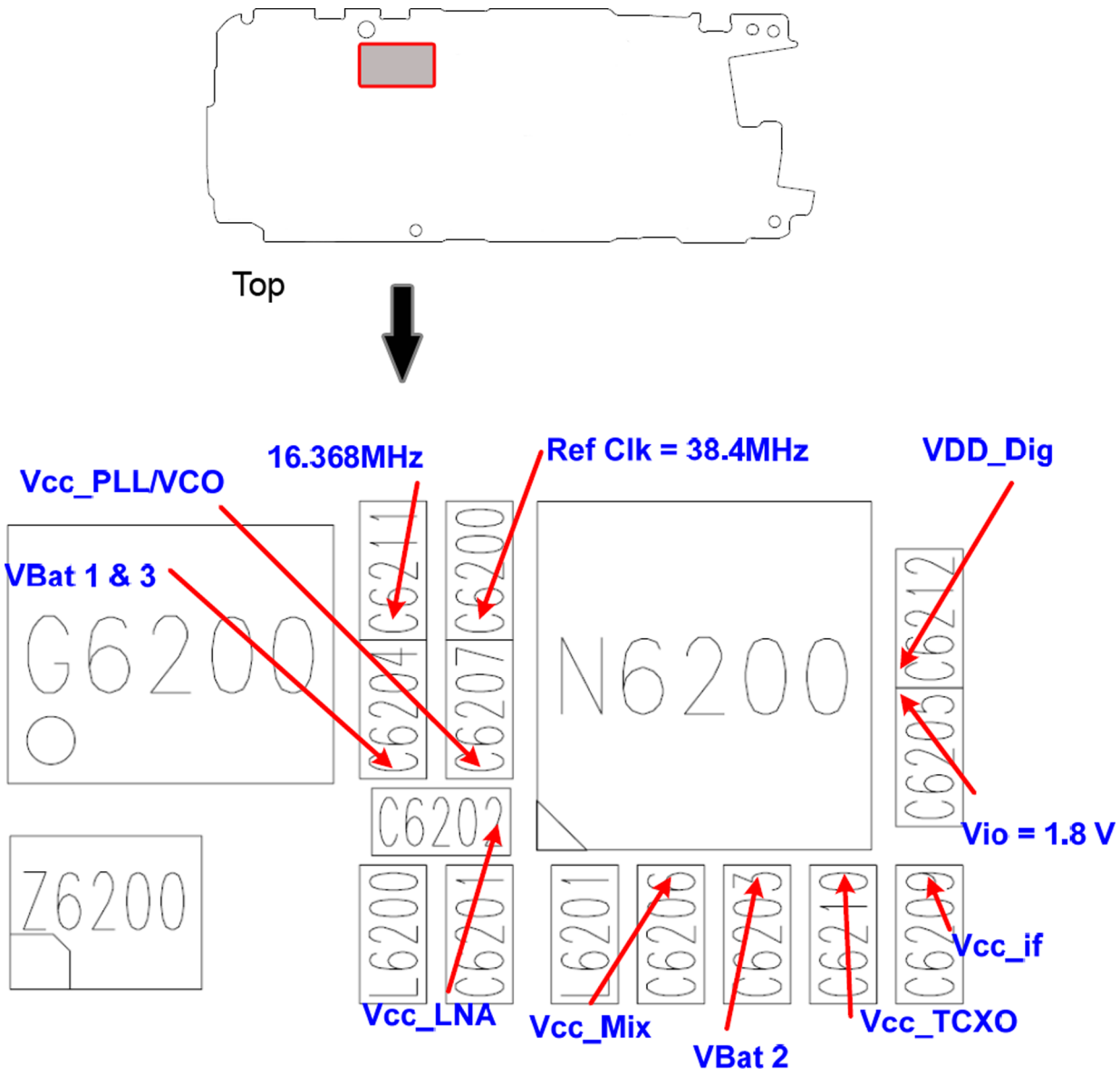

Figure 20 GPS layout and basic test points

GPS settings for Phoenix

GPS control

Context

Use the following to test GPS using Phoenix.

Steps

1. Start Phoenix service software.
2. From the **File** menu, select **Scan Product** and check that the correct product version is displayed.

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3. From the **Testing** menu, select **GPS Control**. This opens up *GPS Control* dialogue box, as shown in the figure below, and enables the GPS.

   Select **Idle** to confirm the GPS is enabled and is in idle mode; at this point all clocks should be present, GPS_En_Reset should be high (1.8V), and Vdd_Dig (1.1V), Vcc_TCXO (2.5V) & Vcc_PLL/VCO (1.35V) should be present. Turning **Receiver Action** *On* will turn on all the RF sections of the ASIC and so all LDOs will be on.

   Note: These checks are part of GPS basic checks troubleshooting (page 3–48)

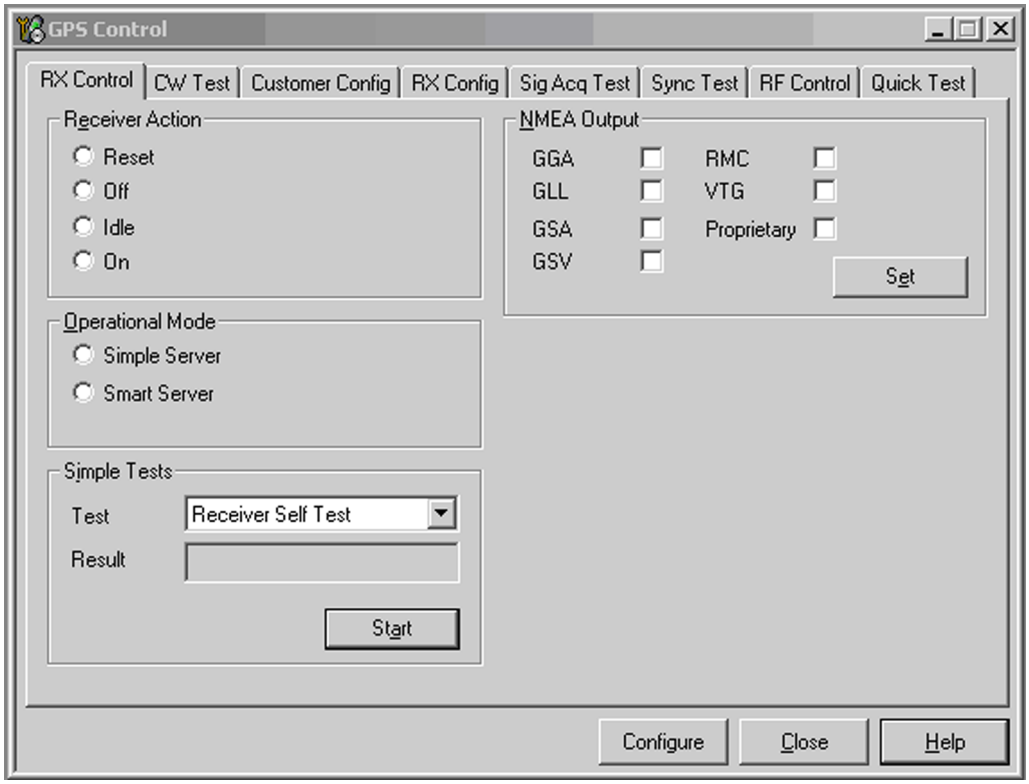

Figure 21 GPS Control dialog box

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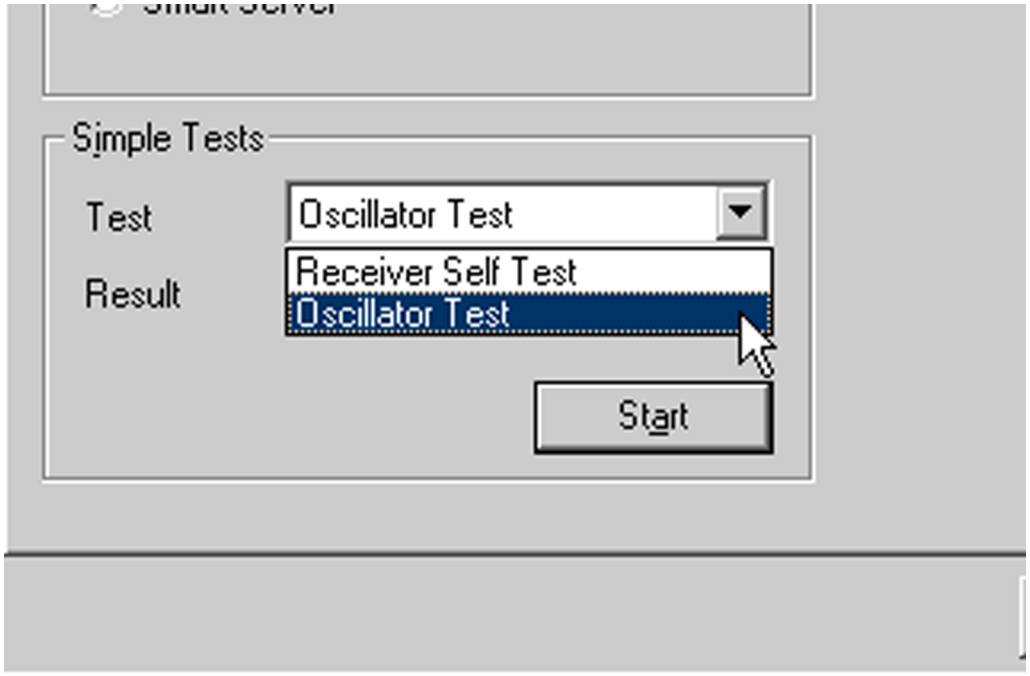

Figure 22 Simple Tests – Oscillator Test & Receiver Self Test

Oscillator test

Context

The 16.368 MHz GPS Clk is compared against the CE Ref Clk and the output is the GPS Clk offset.

Steps

1. Start Phoenix service software.
2. From the **Testing** menu, select **GPS Control**. This opens up *GPS Control* dialogue box and enables the GPS.

   In the *Rx Control* window, go to the **Simple Tests** section, select **Oscillator Test** and click **Start**. The Offset result will be returned and should be within the limits of +- 84Hz.

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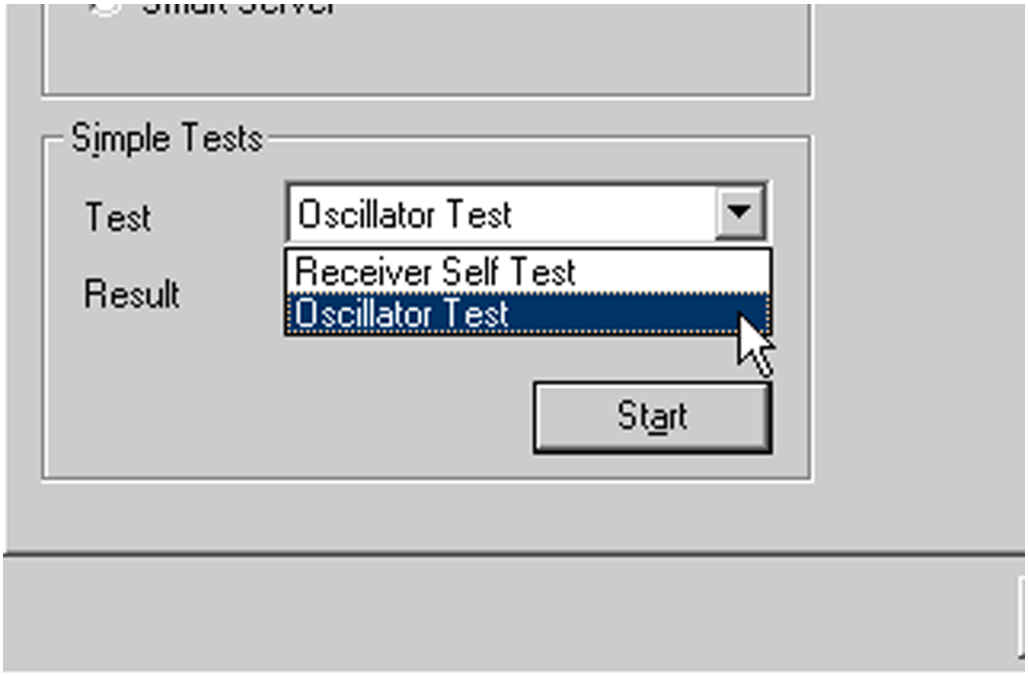

Figure 23 Simple Tests – Oscillator Test

Receiver self test

Context

Receiver self test can be used to check the correct functionality of the receiver core. For the test, GPS software configures internal test source to generate synthetic GPS-like data, processing it in the baseband and writing the results into the channel processor memory. The test compares the data in the channel memory against the expected value and reports a PASS/FAIL status.

Steps

1. Start Phoenix service software.
2. From the **Testing** menu, select **GPS Control**. This opens up *GPS Control* dialogue box and enables the GPS.

   In the *Rx Control* window, go to the **Simple Tests** section, select **Receiver Self Test** and click **Start**. The test returns a PASS/FAIL result.

   Note: The Oscillator Test should not be run after the Receiver Self Test. This sequence of tests may cause the Oscillator test to prolong and result in Phoenix timing out. If you are carrying out both of these tests, run the Oscillator Test first, after which you can run the Receiver Self Test.

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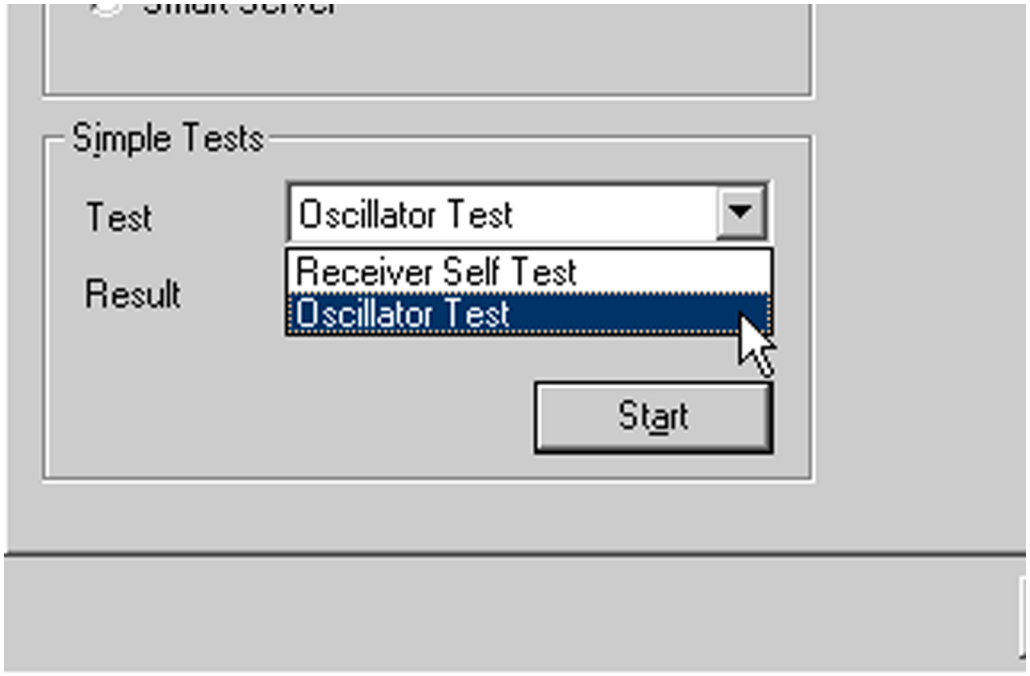

Figure 24 Simple Tests – Receiver Self Test

CW Test

Context

This test reports the SNR of a CW signal input to the GPS antenna port.

Steps

1. Start Phoenix service software.
2. From the **Testing** menu, select **GPS Control**. This opens up *GPS Control* dialogue box and enables the GPS.

   In the *CW Test* window, ensure the input settings are as shown in the figure below. Inject 1575.52 MHz tone at the GPS antenna test connector at a level of -110dBm and click **Start**.

   For Pin = -110dBm and negligible other losses, the expected result ranges are:

   - Galvanic 29.8dB to 38.1dB
   - Radiated 25.8dB to 38.1dB

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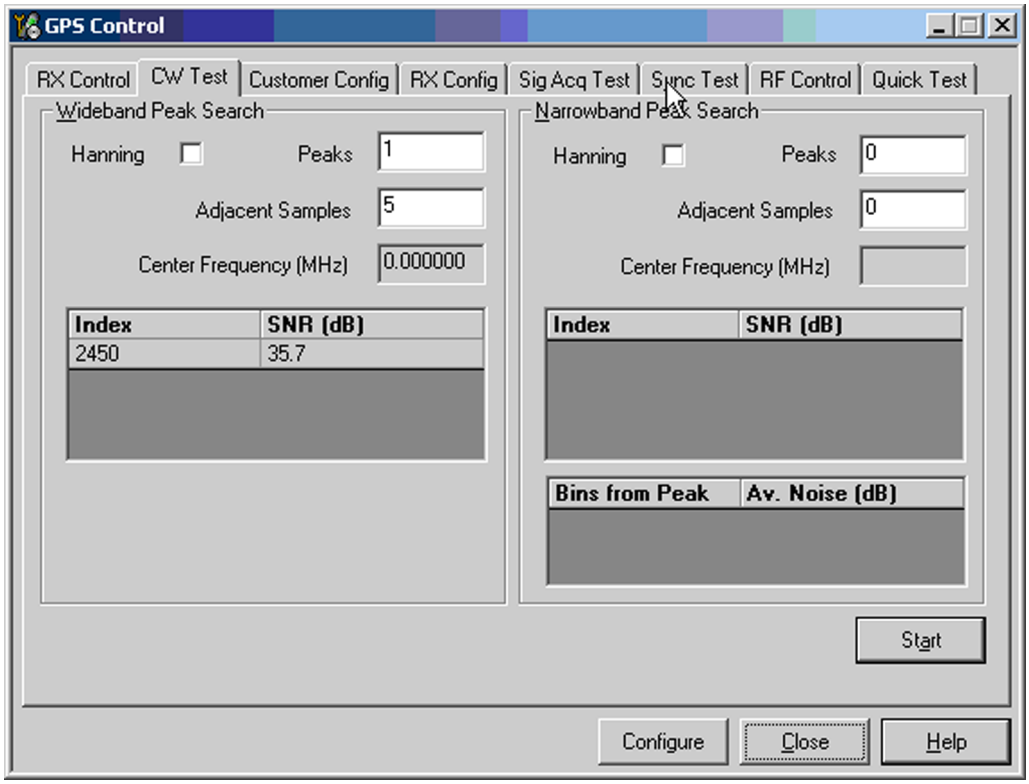

Figure 25 CW Test window

Quick Test window

Because the *Quick Test* runs the *Receiver Self Test* before the *Oscillator Test*, it may cause a timeout on the *Oscillator Test*. It does not necessarily mean that Oscillator Test has failed, but carrying out the Oscillator Test (page 3–43), Receiver Self Test (page 3–44) and CW Test (page 3–45) individually will give more valid results.

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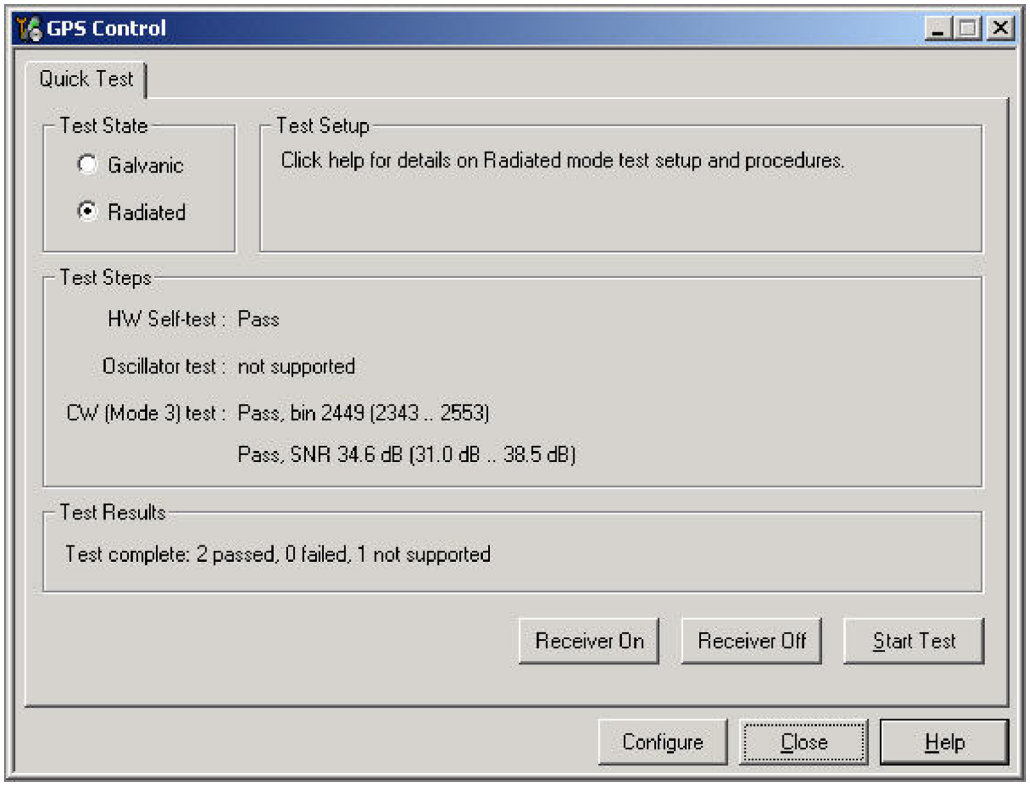

Figure 26 GPS Quick Test window for GPS troubleshooting

GPS failure troubleshooting

Context

GPS troubleshooting is broken down into two parts: General GPS failure & GPS basic checks. The GPS failure troubleshooting flow can be followed and, where applicable, will feed into the basic checks troubleshooting flow.

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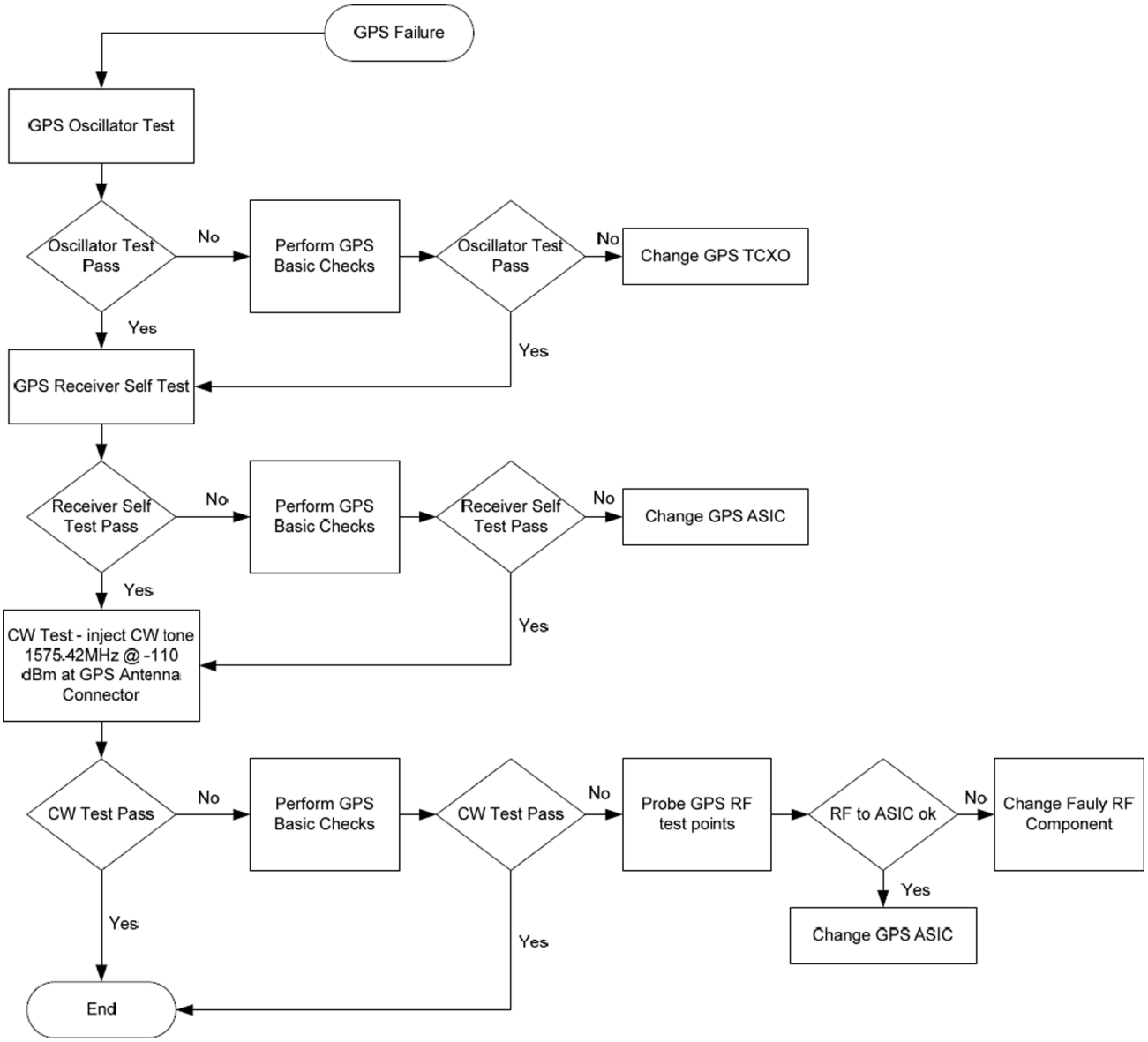
Troubleshooting flow



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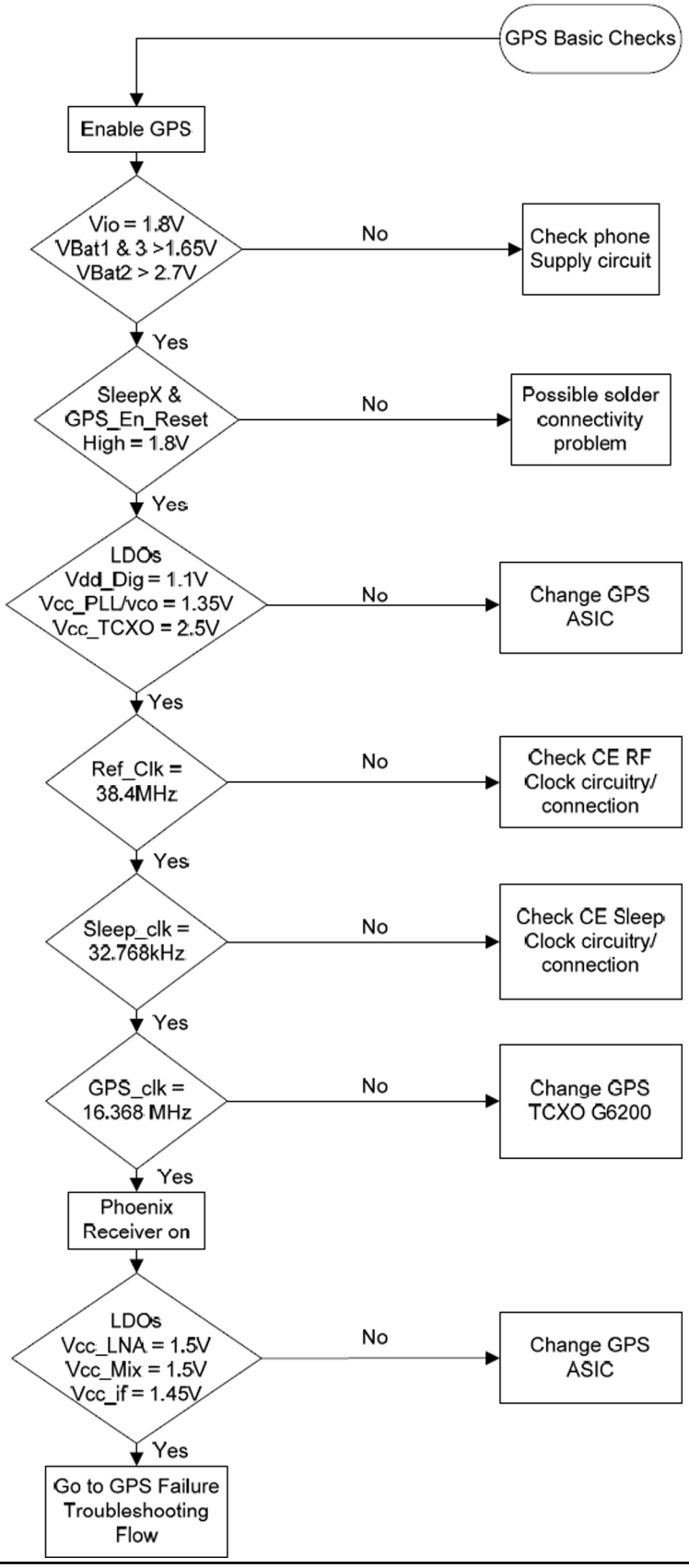
GPS basic checks troubleshooting

Troubleshooting flow



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Audio troubleshooting

Audio troubleshooting test instructions

External earpiece, internal earpiece and internal handsfree outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

The input signal for each loop test is single-ended.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- Phoenix service software
- Battery voltage 3.7V

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths are used in the tests:

- AV mic to AV ear
- AV mic to HP ear
- Ext microphone in Int handsfree out

> **Note:** The internal uplink microphones can be tested using the Phoenix self test "ST-DIGIMIC-TEST". If the test result is PASS, the uplink microphones are electrically OK. For more thorough testing, see section Internal microphone troubleshooting (page 3–55).

Each audio loop sets routing from the specified input to the specified output enables a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in a table in the following section.

Phoenix audio loop tests and test results

The results presented in this table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speakers are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage, 1 kHz sine [mVp-p]	Single-ended output voltage [mVp-p]	Output DC level [V]
AV mic to AV ear	HS_MIC and GND	HS_EAR_R and GND	+21.3	100	584	0
		HS_EAR_L and GND				

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Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage, 1 kHz sine [mVp-p]	Single-ended output voltage [mVp-p]	Output DC level [V]
AV mic to HP ear	HS_MIC and GND	B2101 pad1 and GND B2101 pad2 and GND	+18.2	100	407	1.5
Ext microphone in Int handsfree out	HS_MIC and GND	B2102 pad1 and GND B2102 pad2 and GND B2103 pad1 and GND B2103 pad2 and GND	+3.6 with lowpass filter	1000	758 with lowpass filter See the *Measurement data* graphics below	NA

Measurement data

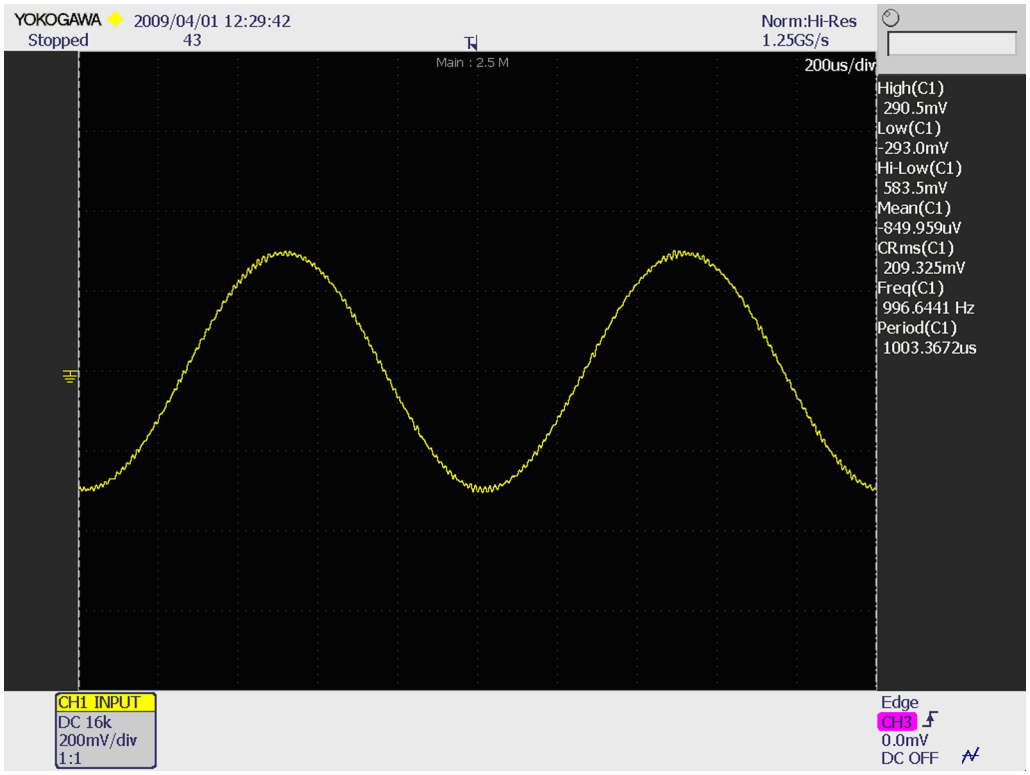

Figure 27 AV mic to AV ear, single-ended loop measurement. 16 kHz lowpass filter is used to attenuate noise from the signal. The filter is optional.

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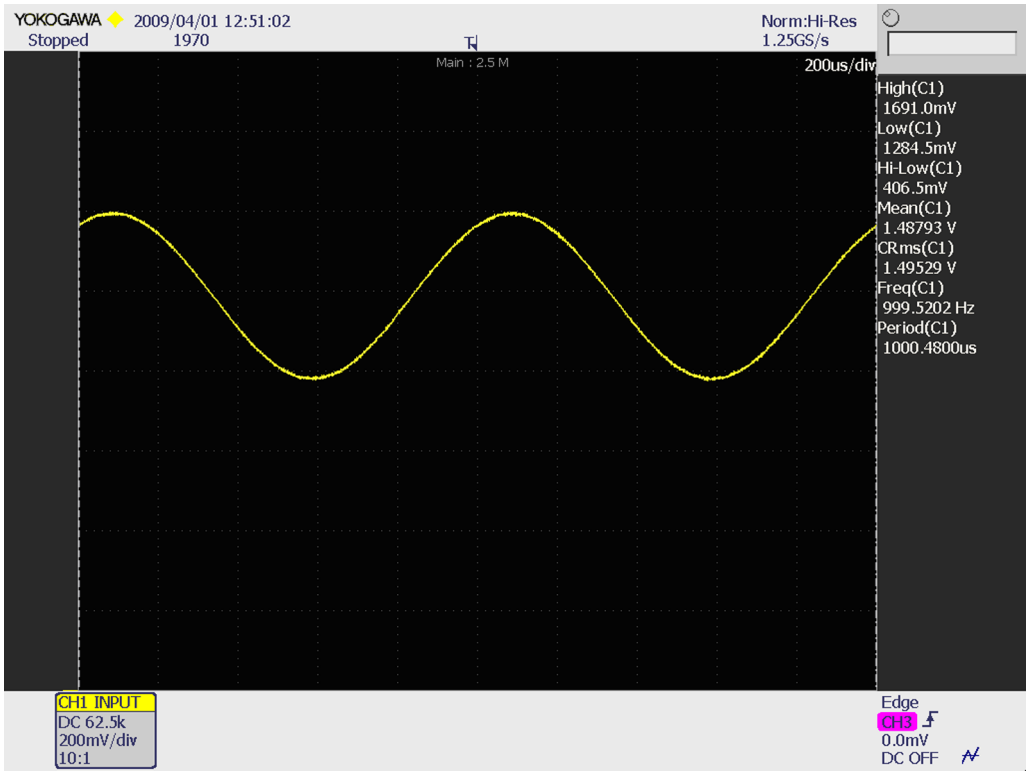

Figure 28 AV mic to HP ear, single-ended loop measurement. 62.5 kHz lowpass filter is used to attenuate noise from the signal. The filter is optional.

Figure 29 Ext microphone in Int handsfree out, single-ended loop measurement without filter.

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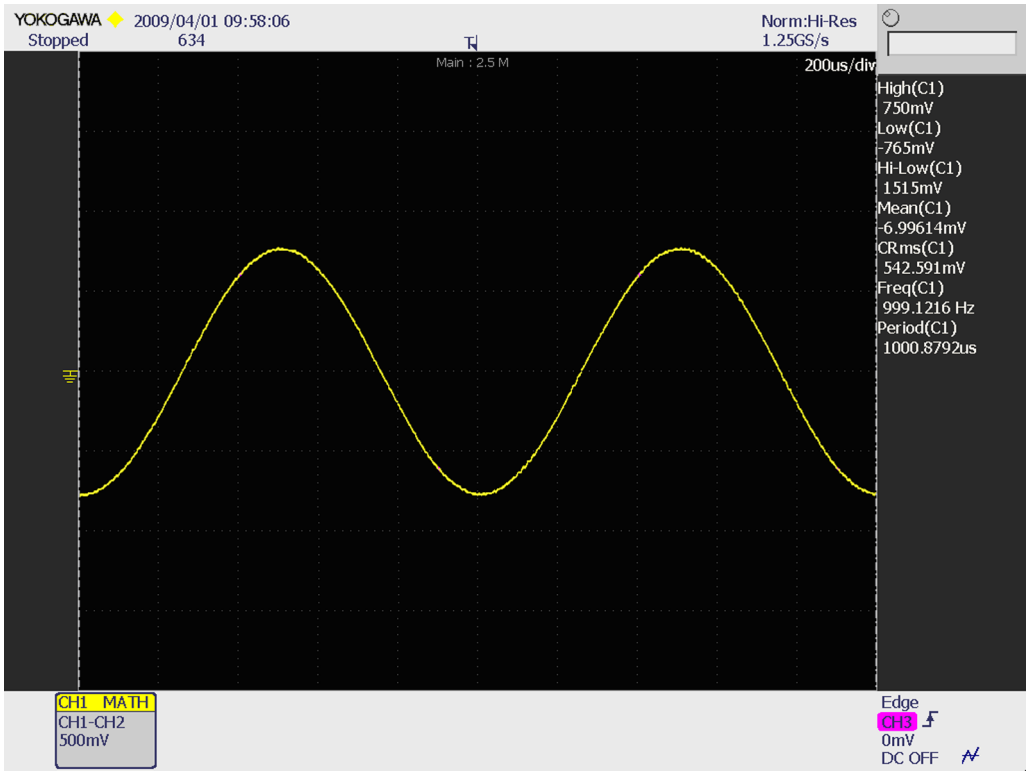

Figure 30 Ext microphone in Int handsfree out, differential loop measurement with 8 kHz lowpass filter. The signal is measured differentially between the pads of B2102 or B2103.

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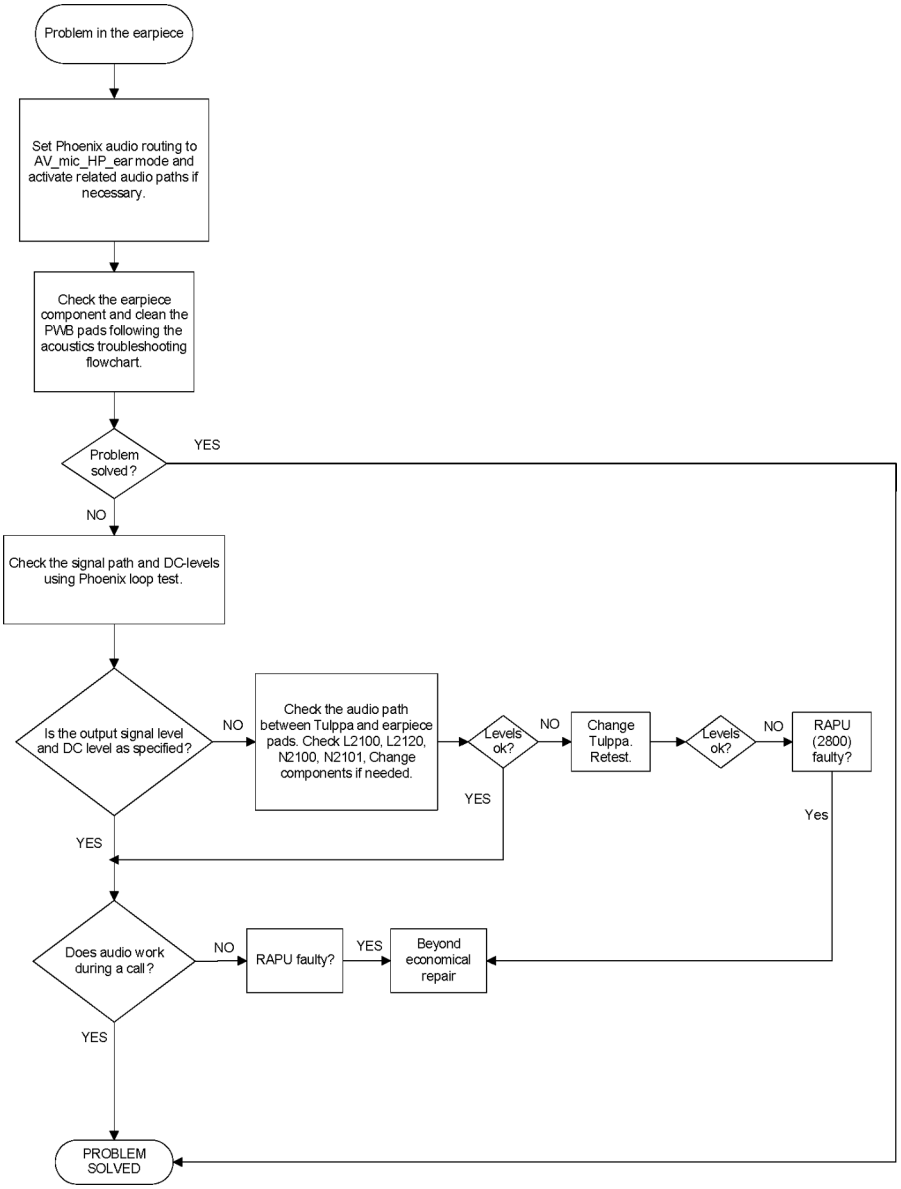
Internal earpiece troubleshooting

Troubleshooting flow



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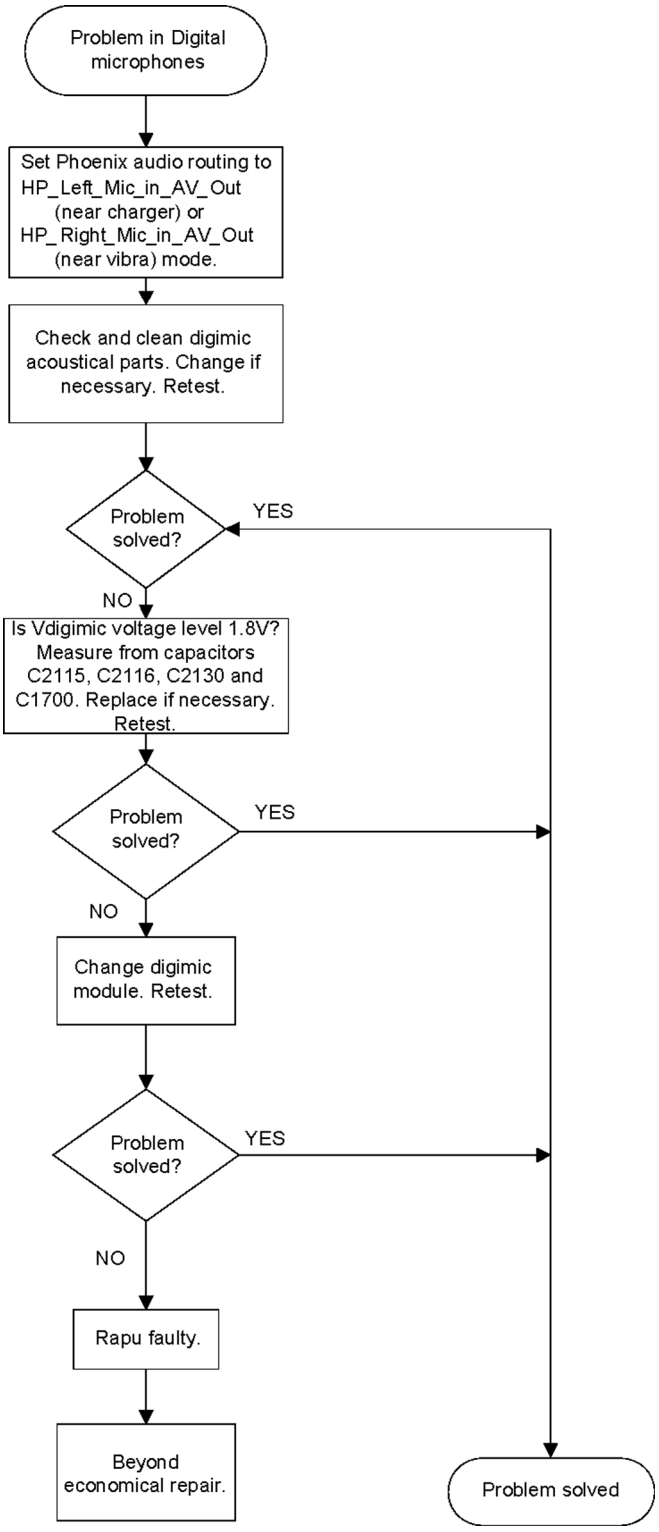
Internal microphone troubleshooting

Internal microphone troubleshooting

Troubleshooting flow



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EANC microphone testing

Context

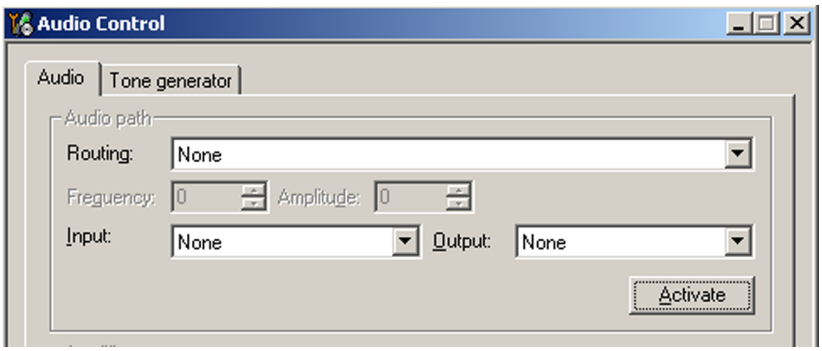
For this test, Phoenix 2009.07.002.37336 or newer is needed.

Steps

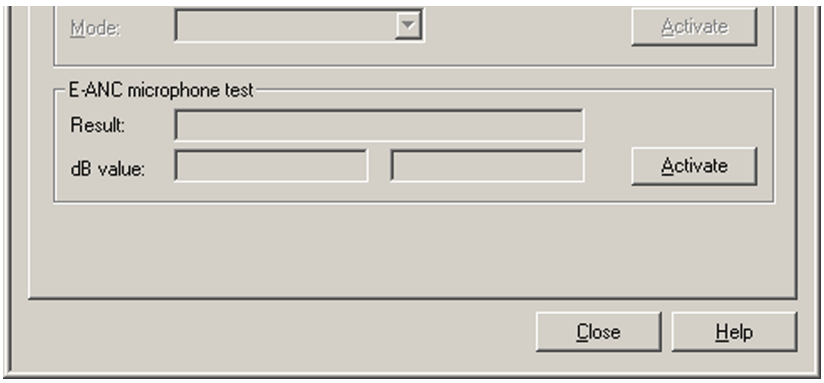
1. Put the phone on the jig on a table.

   The area around the phone should be free from objects. Ambient noise should be low so it does not disturb the test.
2. Start Phoenix service software.
3. From the *File* menu, select **Scan Product** and check that the correct product version is displayed.
4. Set the phone in test mode.
5. From the **Testing** menu, select **Audio Control**.

   The *Audio Control* dialogue box is displayed.
6. Audio routing must be turned off before this test. In the *Audio Control* window, select **None** and click **Activate**.



   Failing this, several dB of measurement error is created. Check this especially after uplink microphone tests.
7. In the *Audio Control* window, activate **E-ANC Microphone Test**.



   The IHF speakers emit a 1 kHz tone and the EANC microphones measure the sound level.

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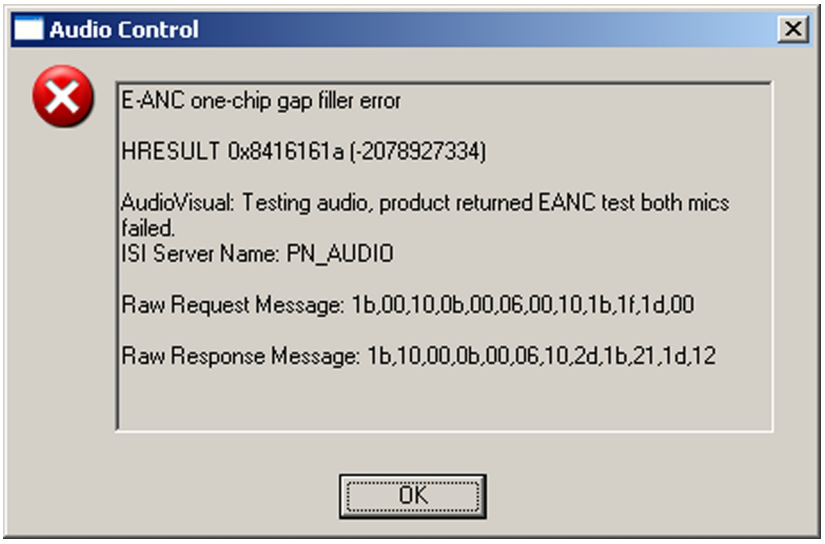
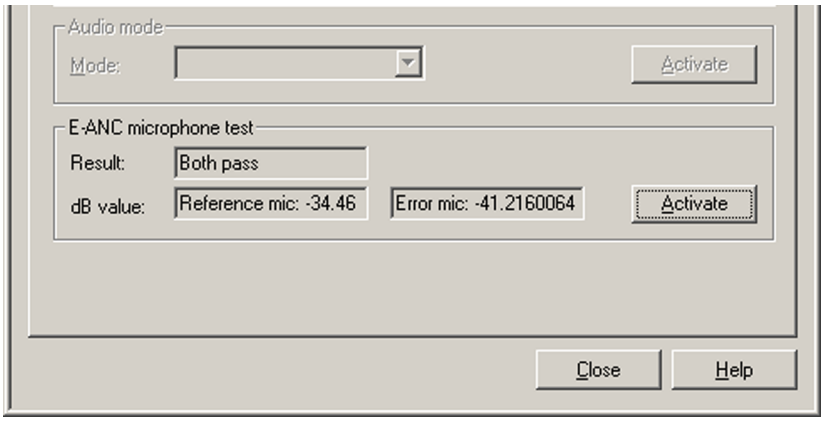
8. Close the error pop-up window, if it appears.



9. The test returns dB values for reference mic (the backside mic) and the error mic (the earpice mic).



Acceptable dB values are:

- Reference mic: -21 dB ... -41 dB
- Error mic: -28 dB ... -48 dB

A much lower value may indicate a fault in the microphone or a block in the sound inlet.

It is recommended to run this test more than once and observe the results. There may be an electrical fault if a microphone gives exactly the same result each time.

The test returns also PASS/FAIL information for both microphones.

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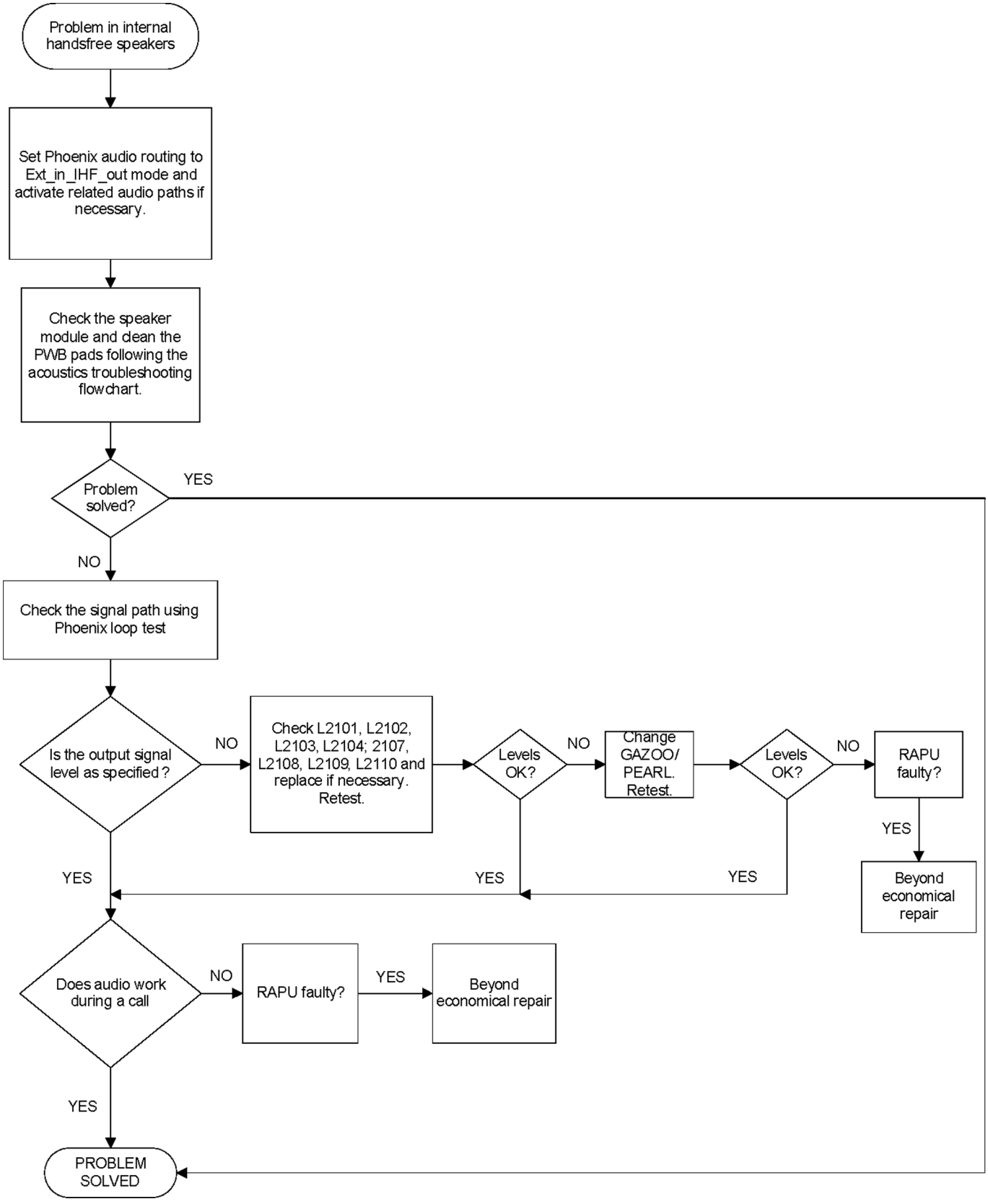
Internal handsfree (IHF) troubleshooting

Troubleshooting flow



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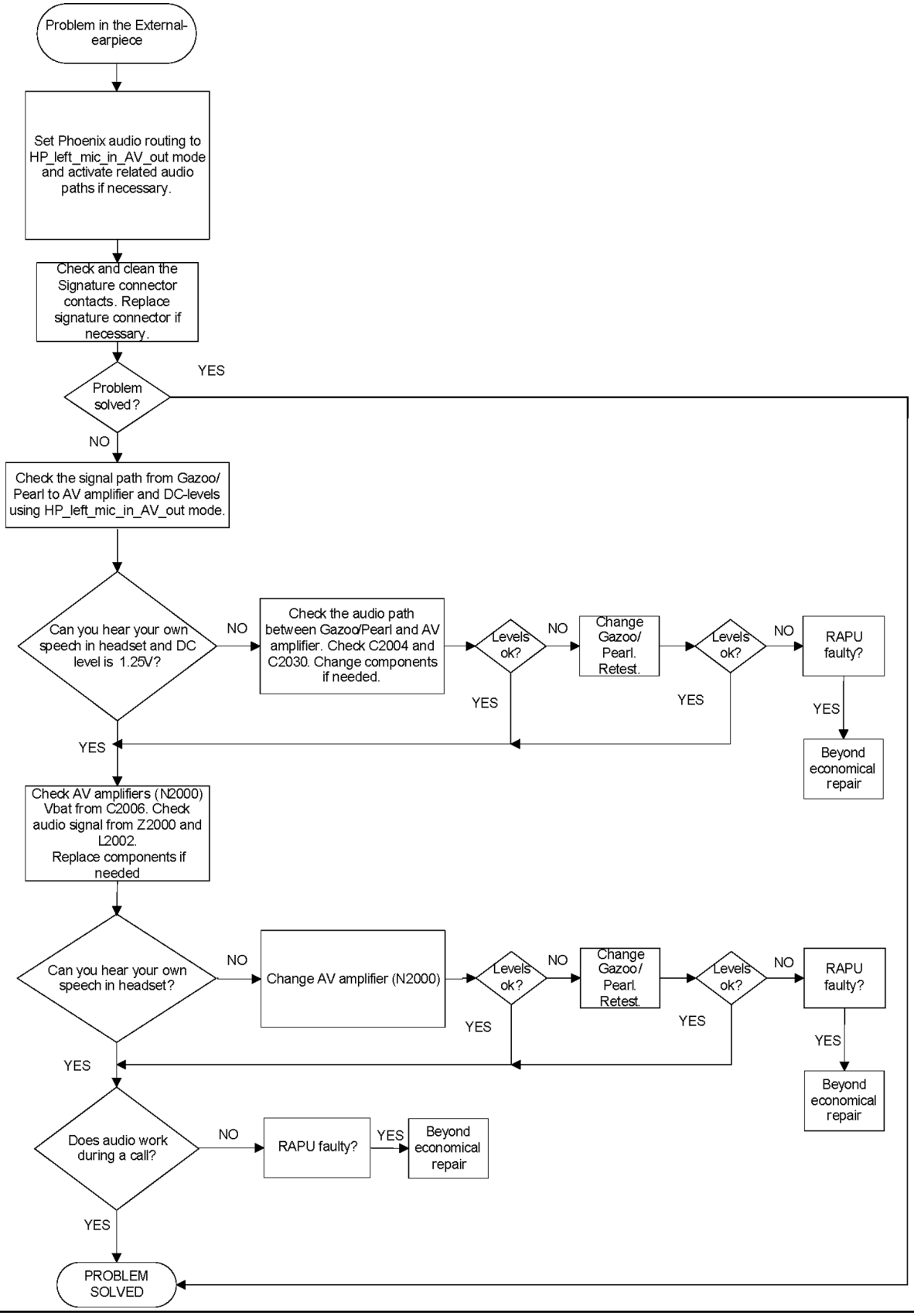
External earpiece troubleshooting

Troubleshooting flow



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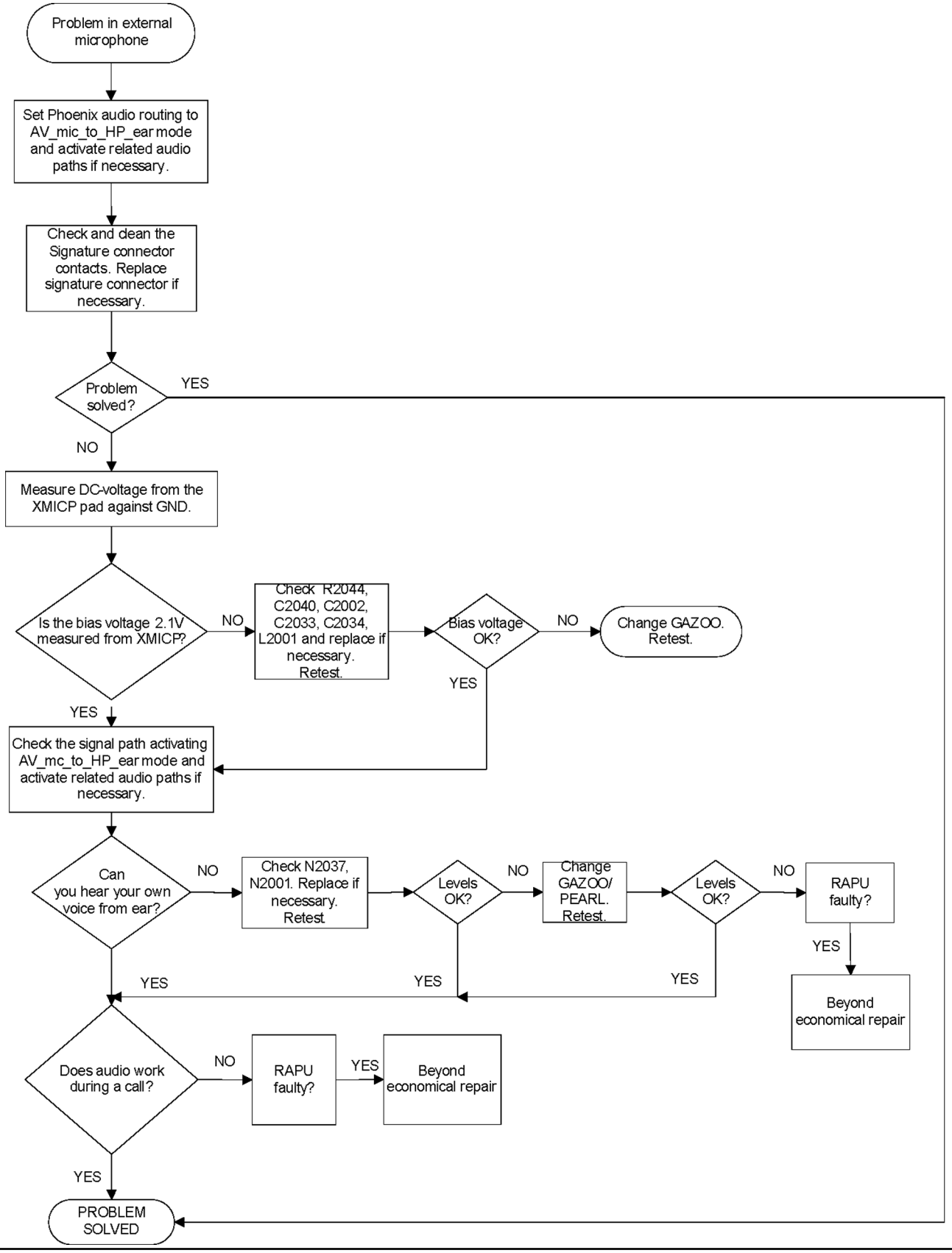
External microphone troubleshooting

Troubleshooting flow



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Acoustics troubleshooting

Introduction to acoustics troubleshooting

Acoustics design ensures that the sound is detected correctly with a microphone and properly radiated to the outside of the device by the speaker. The acoustics of the phone include three basic systems: earpiece, EANC error microphone, EANC reference microphone, stereo integrated handsfree (IHF) and two digital uplink microphones.

The sound reproduced from the earpiece readiates through a single hole on the front cover (A-cover). The EANC error microphone is located in the opening in front of the earpiece. The error microphone is soldered on a flex PWB in front of the earpiece. The reference microphone is located at the bottom side if the PWB and its sound hole is in the back of the phone near the camera. The sound reproduced from the 2 IHF speakers radiates from the sound holes located in the top part of the phone at the sides. The uplink microphones are located on the top side of the PWB. The sound hole of the primary microphone is in the bottom end of the phone at left. The sound hole of the secondary microphone is in the keyboard between the left soft key and the send key.

For a correct functionality of the phone, all sound holes must be always open. When the phone is used, care must be taken not to close any of those holes with a hand or fingers. The phone should be dry and clean, and no objects must be located in such a way that they close any of the holes.

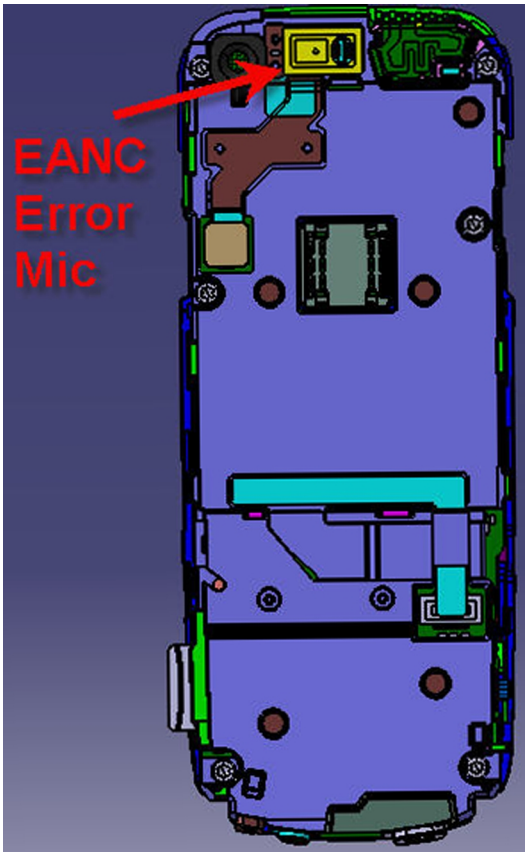

Figure 31 EANC error microphone

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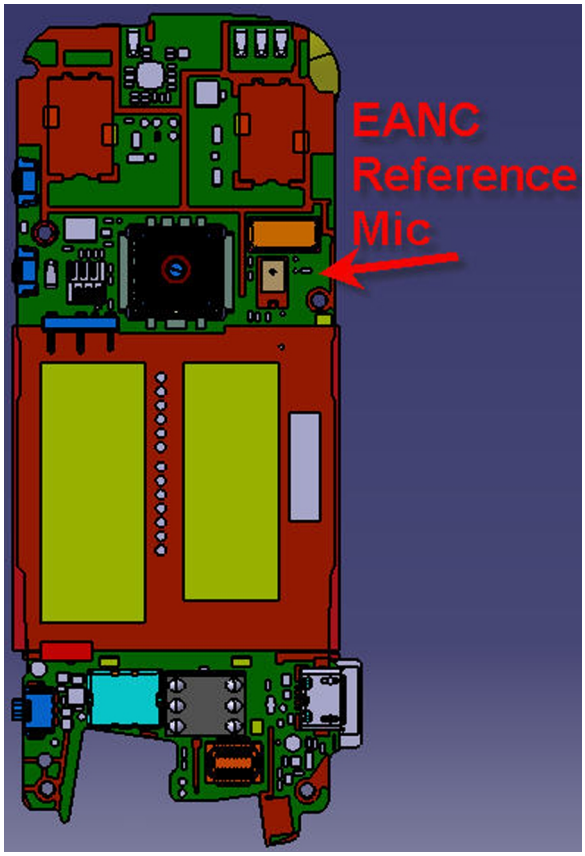

Figure 32 EANC reference microphone

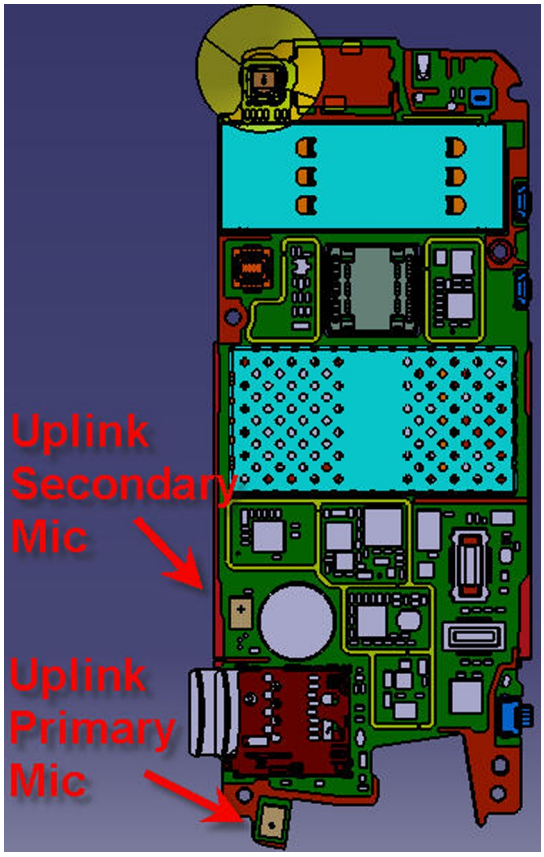

Figure 33 Audio uplink microphones

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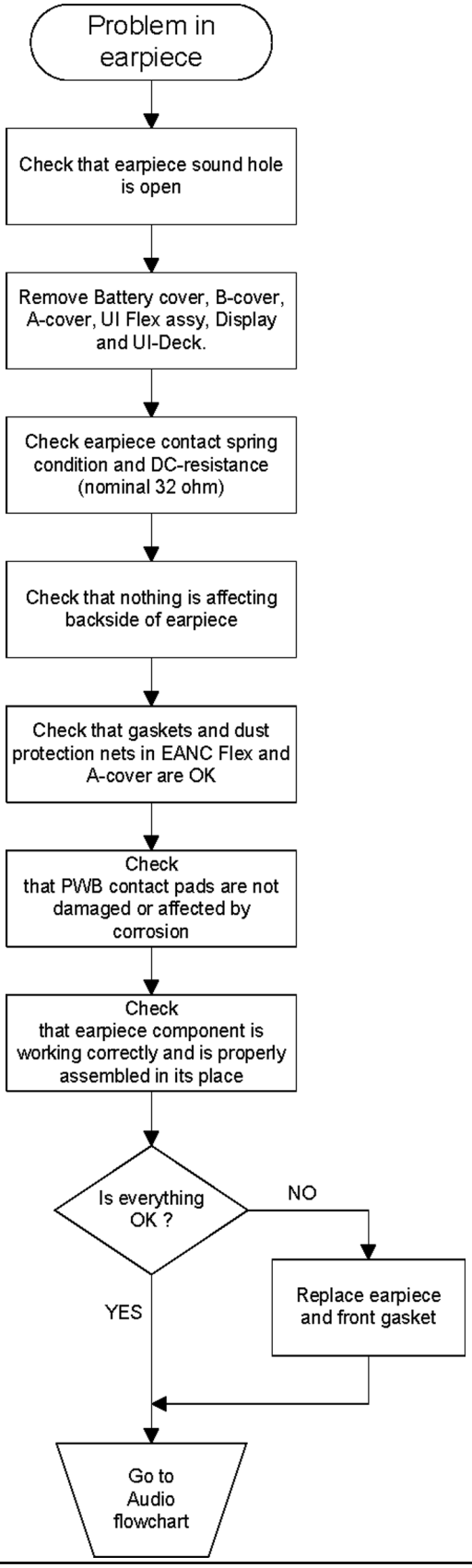
Earpiece troubleshooting

Troubleshooting flow



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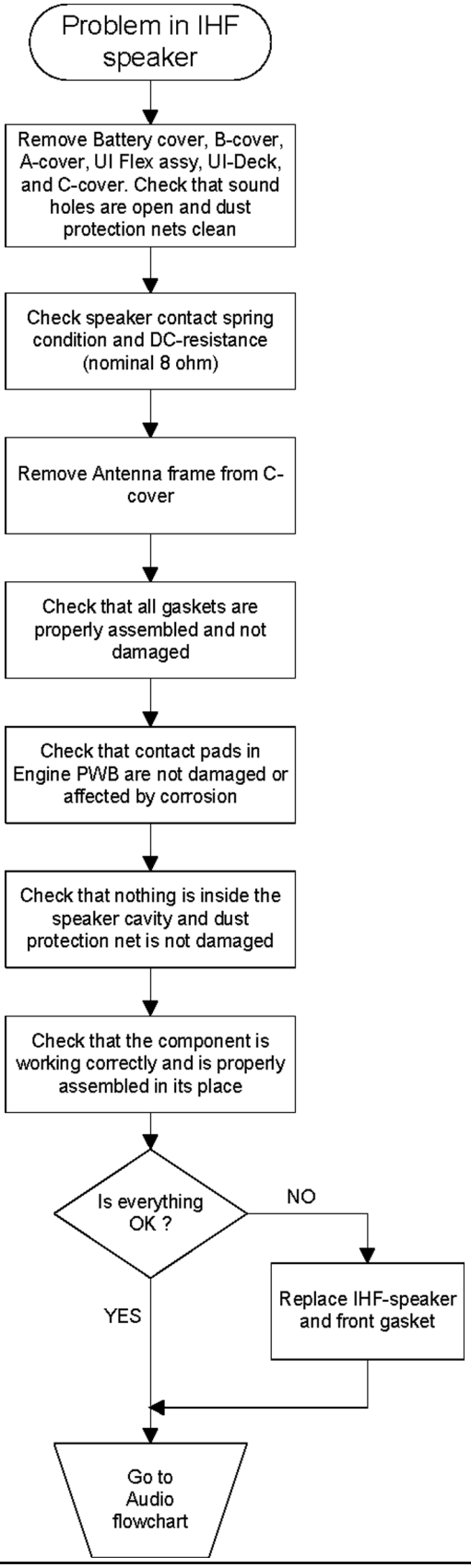
IHF troubleshooting

Troubleshooting flow



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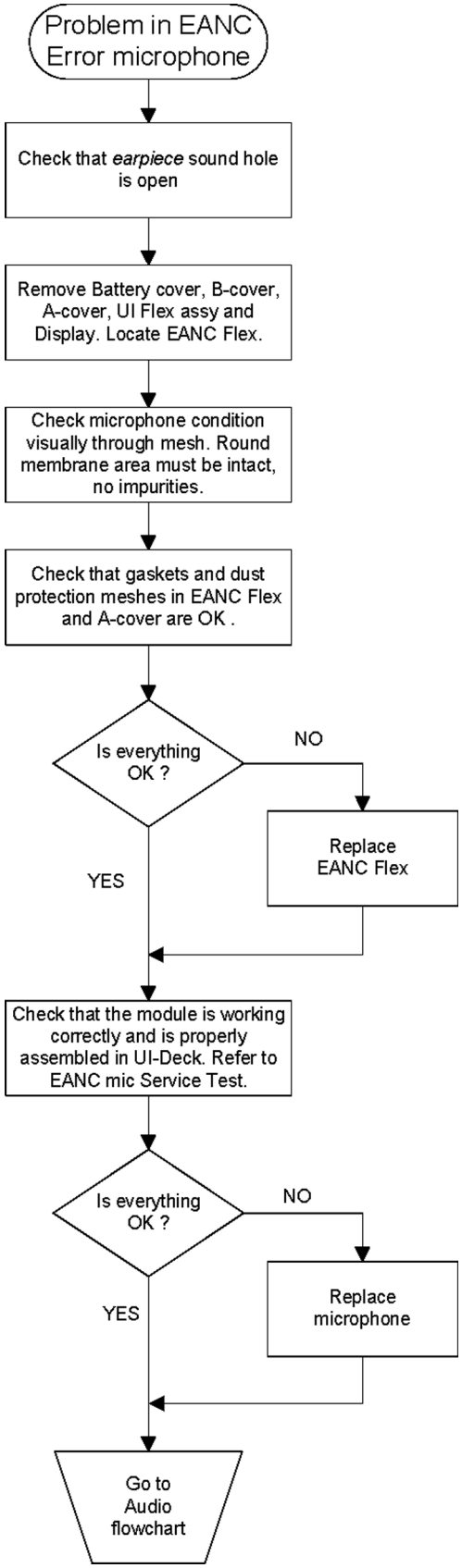
EANC error microphone troubleshooting

Troubleshooting flow



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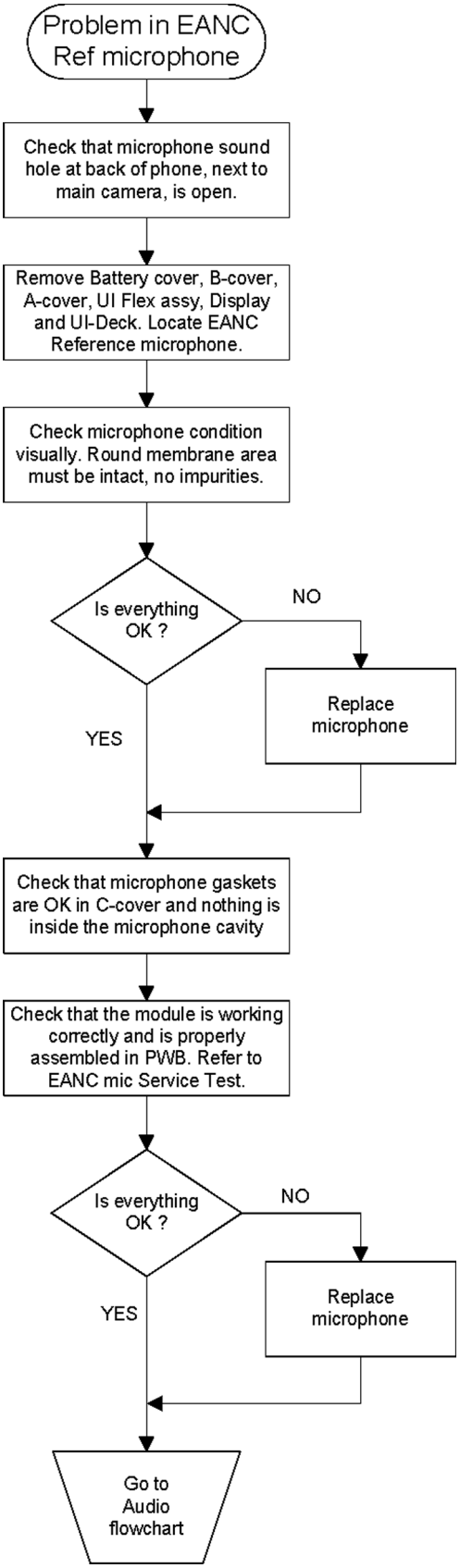
EANC reference microphone troubleshooting

Troubleshooting flow



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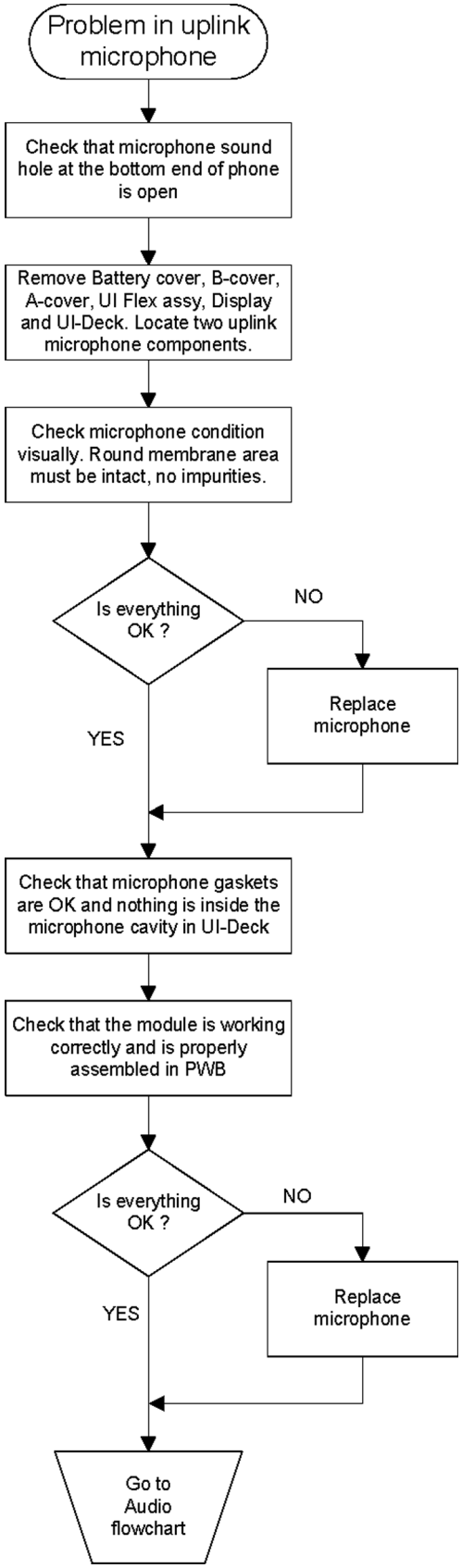
Uplink microphone troubleshooting

Troubleshooting flow



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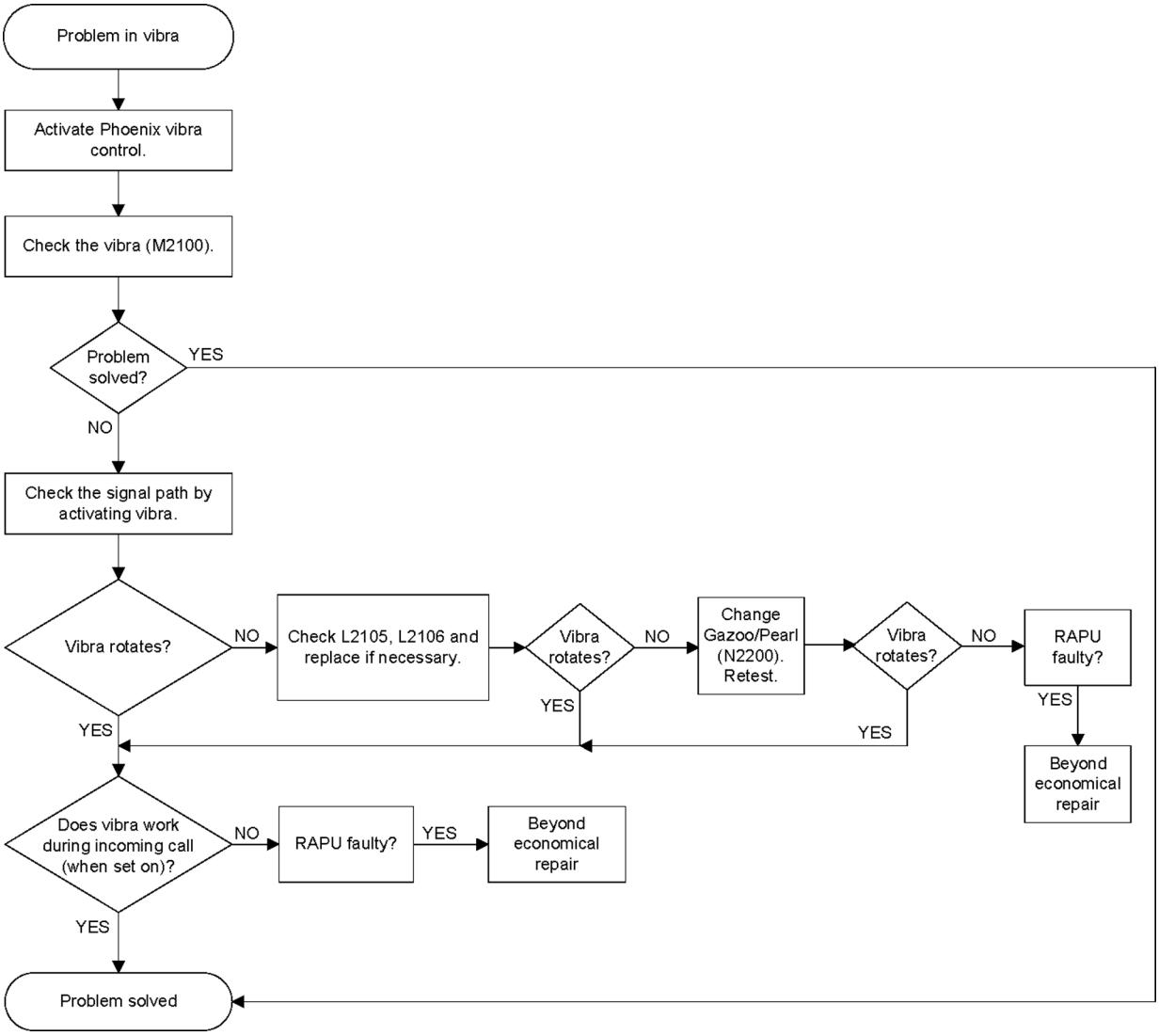
Vibra troubleshooting

Troubleshooting flow



Bluetooth and FM radio troubleshooting

Bluetooth and FM radio introduction

The Bluetooth and FM radio are combined in the same ASIC, so both features are checked when troubleshooting. The following problems can occur with the Bluetooth and FM radio hardware:

Symptom	Problem	Repair solution
Unable to switch on Bluetooth on phone user interface.	Open circuit solder joints or component failure of BTH/ FM ASIC/module BB ASICs or SMD components.	Replacement of Bluetooth/FM ASIC/ module.

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Symptom	Problem	Repair solution
Able to send data file to another Bluetooth device, but unable to hear audio through functional Bluetooth headset.	Open circuit solder joints or component failure of BTH/ FM ASIC/module BB ASICs (PCM interface).	Replacement of Bluetooth/FM ASIC/ module.
Able to turn on Bluetooth on phone user interface, but unable to detect other Bluetooth devices.	Open circuit solder joints or detacted component in Bluetooth antenna circuit.	Repair of Bluetooth antenna circuit.
Able to turn on FM radio and Bluetooth on phone user interface, but unable to detect local FM radio stations with FM headset inserted.	Open circuit solder joints or detached component in FM antenna circuit.	Repair of FM antenna circuit.
Able to perform scans to detect local FM radio stations with functional FM headset inserted, but unable to hear FM audio through headset.	Open circuit solder joints or detached component in FM audio path between Bluetooth/FM ASIC and headset.	Repair of FM audio circuit.

Bluetooth and FM radio component placement

The figure below shows the test points for BTHFMRDS2.2D in RM-424.

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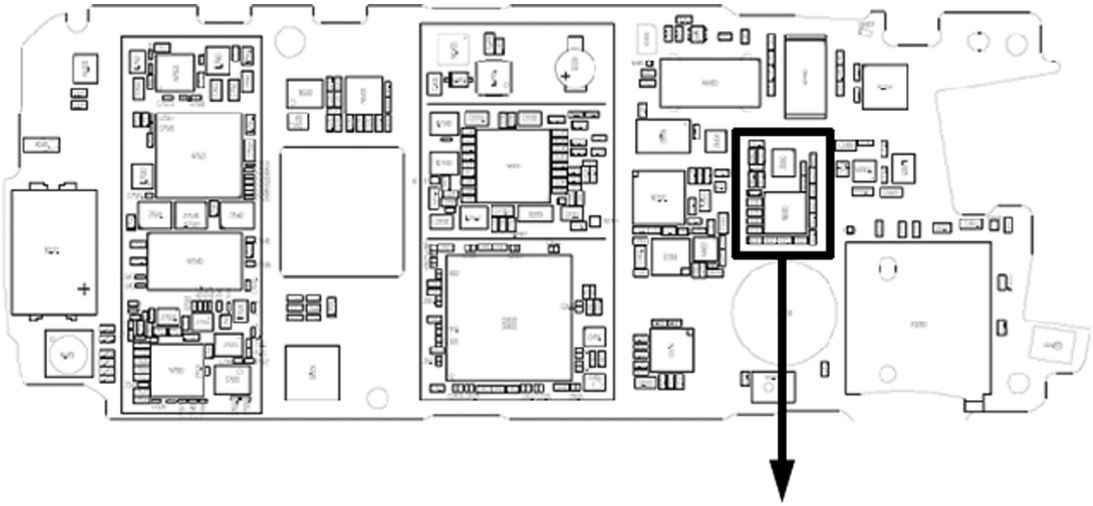

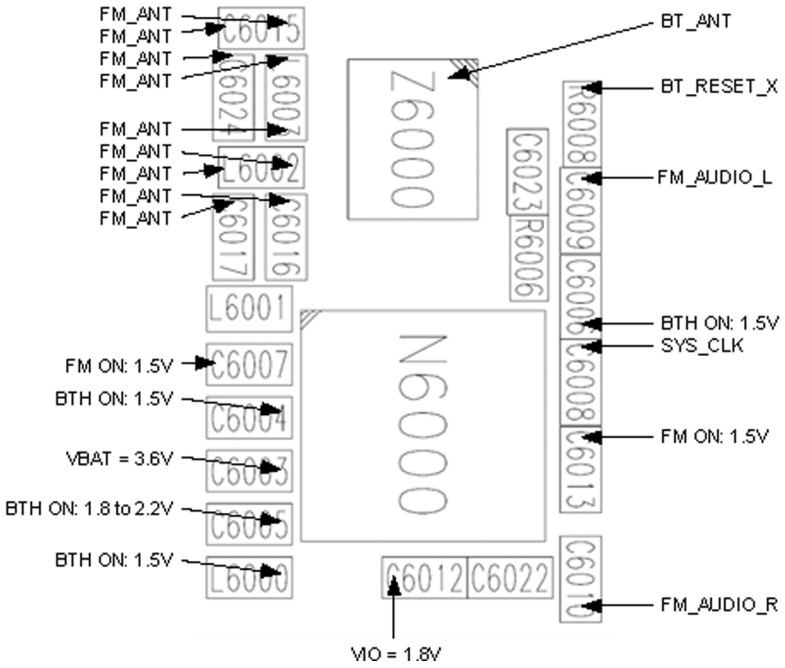

Figure 34 Test points in Bluetooth-FM ASIC circuit

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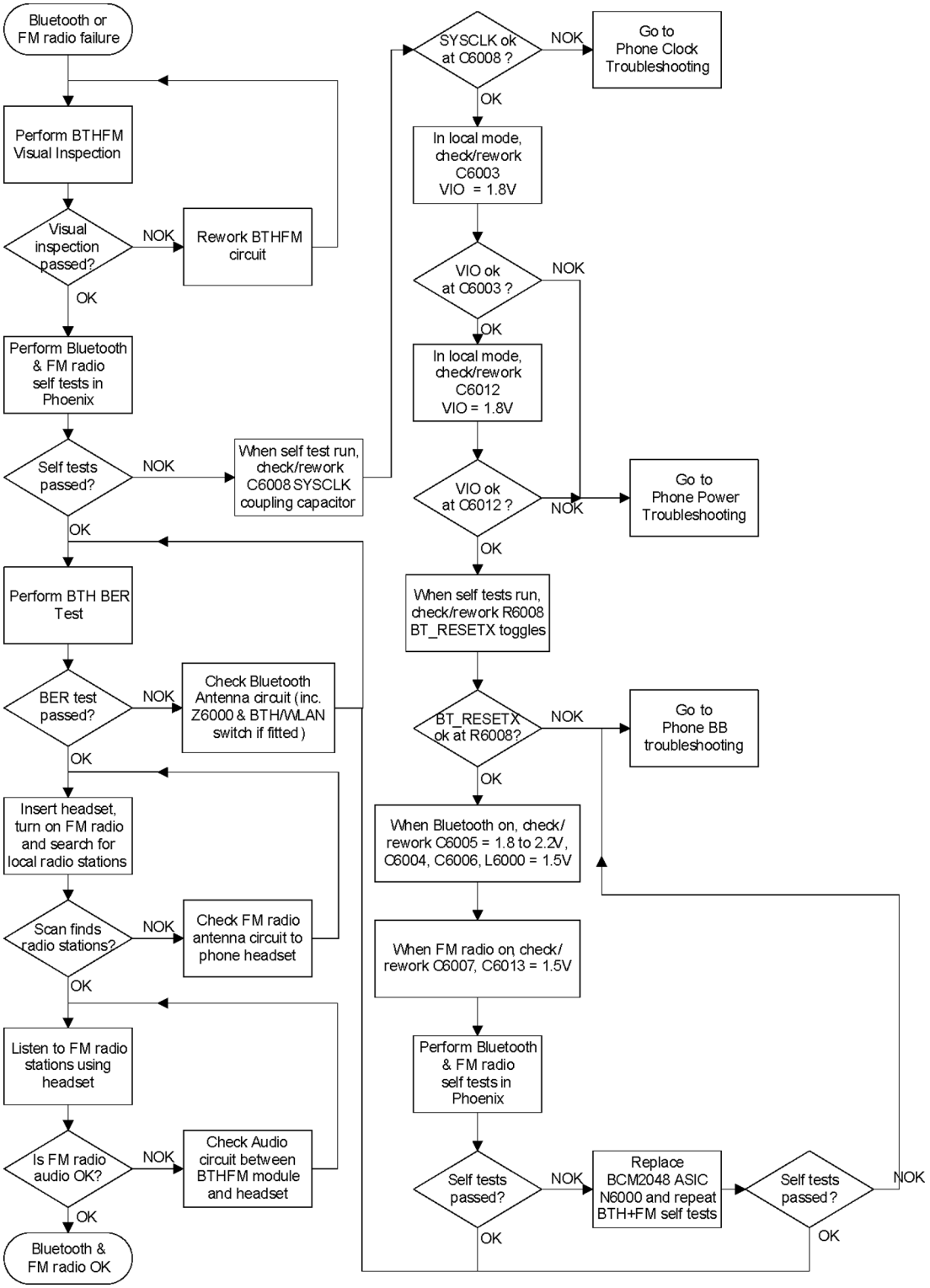
Bluetooth and FM radio module troubleshooting

Troubleshooting flow



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Baseband manual tuning guide

Certificate restoring for BB5 products

Context

This procedure is performed when the device certificate is corrupted for some reason.

All tunings (RF & Baseband, UI) must be done after performing the certificate restoring procedure.

The procedure for certificate restoring is the following:

- Flash the phone with the latest available software using FPS-20 or FPS-21.

  Note: USB flashing does not work for a dead BB5 phone.
- Create a request file.
- Send the file to Nokia by e-mail. Use the following addresses depending on your location:
  - APAC: sydney.service@nokia.com
  - CHINA: repair.ams@nokia.com
  - E&A: salo.repair@nokia.com
  - AMERICAS: fls1.usa@nokia.com
- When you receive a reply from Nokia, carry out certificate restoring.
- Tune the phone completely.

  Note: SX-4 smart card is needed.
- If the phone resets after certificate restoring, reflash the phone again.

Required equipment and setup:

- *Phoenix* service software v 2008.34/38 or newer.
- The latest phone model specific *Phoenix* data package.
- PKD-1 dongle
- SX-4 smart card (Enables BB5 testing and tuning features)
- Activated FPS-20 flash prommer **OR** FPS-21 flash prommer
- Flash update package 08.30.012 or newer for FPS-20 or FPS-21 flash prommers
- CU-4 control unit
- USB cable from PC USB Port to CU-4 control unit
- Phone model specific adapter for CU-4 control unit
- PCS-1 cable to power CU-4 from external power supply
- XCS-4 modular cable between flash prommer and CU-4

  Note: CU-4 must be supplied with +12 V from an external power supply in all steps of certificate restoring.

Steps

1. Program the phone software.
   i Start *Phoenix* and login. Make sure the connection has been managed correctly for FPS-20 or FPS-21.
   ii Update the phone MCU software to the latest available version.
   If the new flash is empty and the phone cannot communicate with *Phoenix*, reflash the phone.

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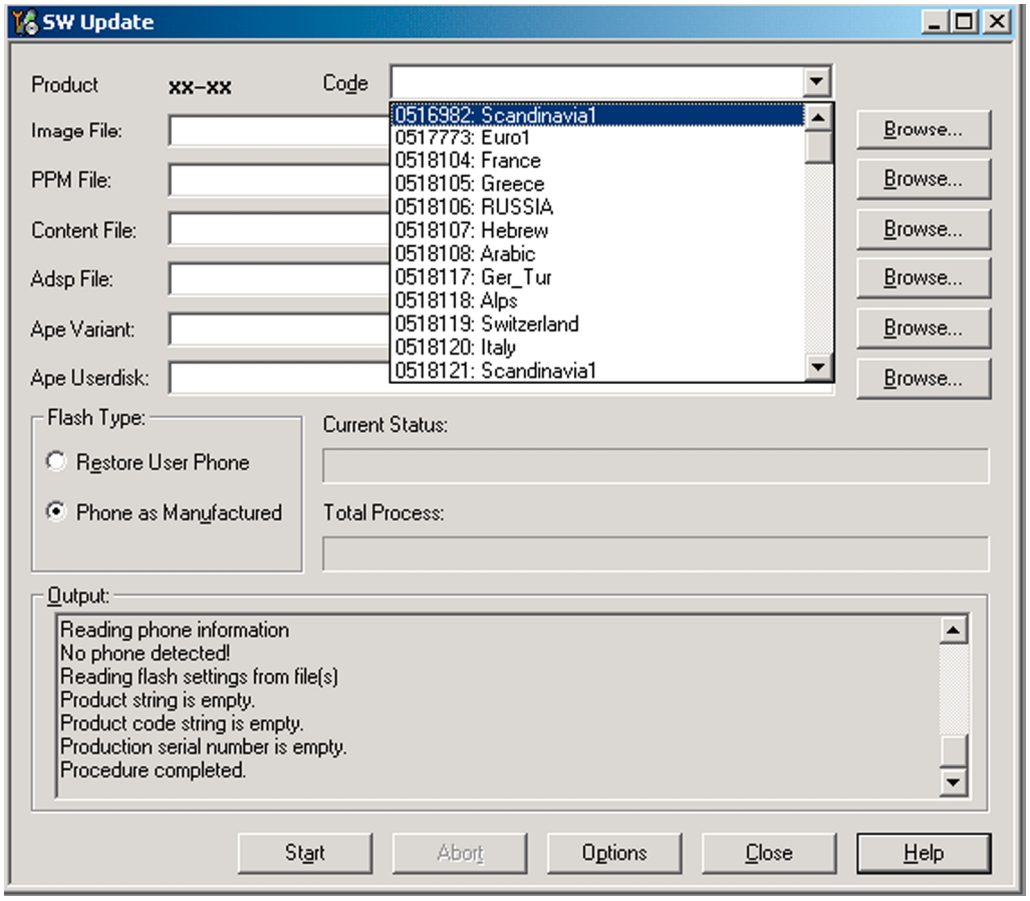
iii Choose the product manually from **File→Open Product** , and click **OK**.

Wait for the phone type designator (e.g. "RM-1") to be displayed in the status bar.

iv Go to **Flashing→SW Update** and wait until *Phoenix* reads the product data as shown in the following picture.



Product	is automatically set according to the phone support module which was opened manually, but the flash files cannot be found because the correct data cannot be read from the phone automatically.
Code	must be chosen manually, it determines the correct flash files to be used. Please choose the correct product code (can be seen in the phone type label) from the dropdown list.
Flash Type	must be set to **Phone as Manufactured**.

v To continue, click **Start**.

Progress bars and messages on the screen show actions during phone programming, please wait.

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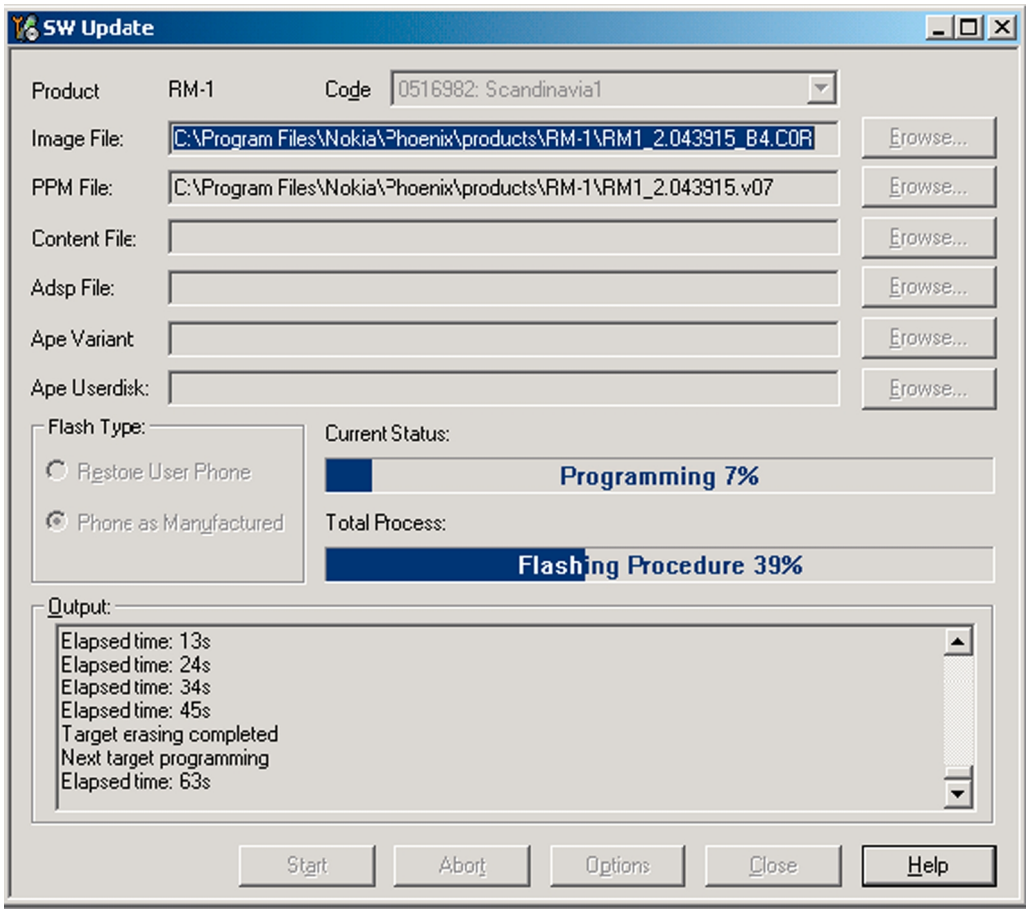


Programming is completed when Flashing Completed message is displayed.

The product type designator and MCU SW version are displayed in the status bar.

vi Close the *SW Update* window and then choose **File→Close Product** .

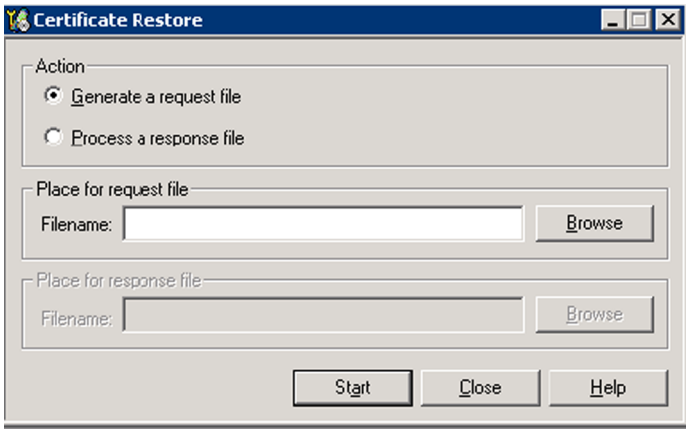
2. Create a *Request* file.

For this procedure, you must supply +12 V to CU-4 from an external power supply.

i To connect the phone with *Phoenix*, choose **File→Scan Product** .

ii Choose **Tools→Certificate Restore** .

iii To choose a location for the request file, click **Browse**.



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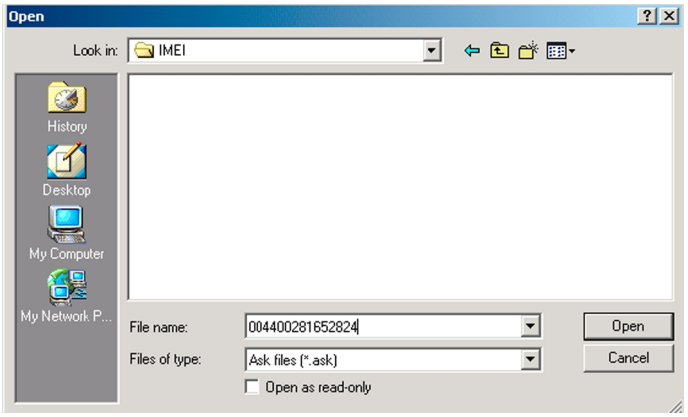
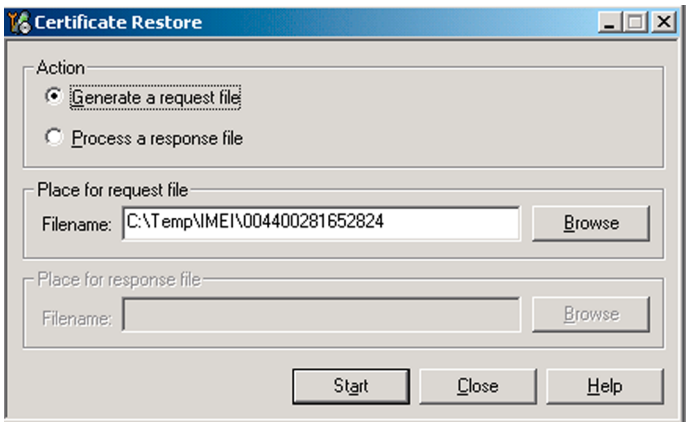
iv Name the file so that you can easily identify it, and click **Open**.



The name of the file and its location are shown.



v To create the *Request* file, click **Start**.

vi When the file for certificate restore has been created, send it to Nokia as an e-mail attachment.

3. Restore certificate.

For this procedure, you must supply +12 V to CU-4 from an external power supply.

i Save the reply file sent by Nokia to your computer.

ii Start *Phoenix* service software.

iii Choose **File→Scan Product** .

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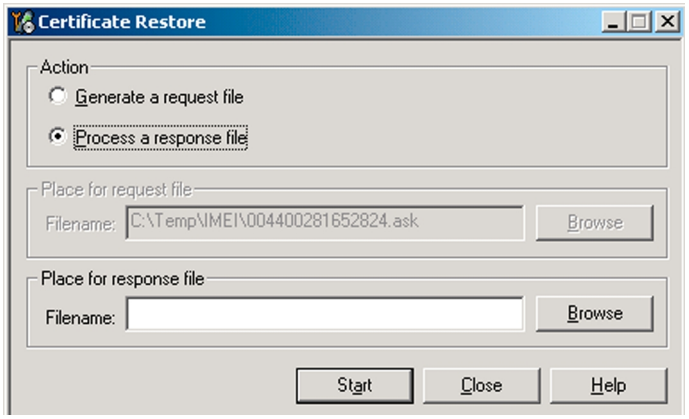
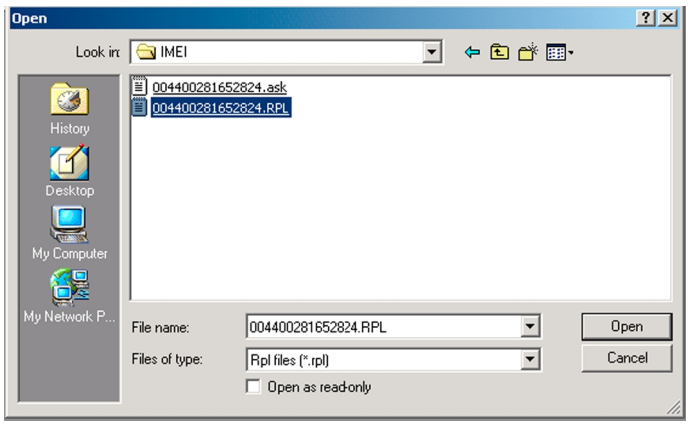
iv From the **Tools** menu, choose **Certificate Restore** and select **Process a response file** in the *Action* pane.



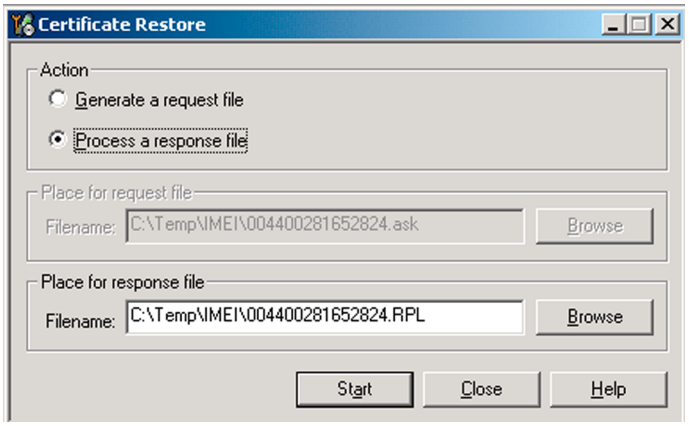
v To choose the location where response file is saved, click **Browse**.

vi Click **Open**.



The name of the file and the path where it is located are shown.

vii To write the file to phone, click **Start**.



Next actions

After a successful rewrite, you must retune the phone completely by using *Phoenix* tuning functions.

Important: Perform all tunings: RF, BB, and UI.

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Energy management calibration

Prerequisites

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File→ Scan Product.**
4. Choose **Tuning→Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.
8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 11 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-30	+40
ADC Gain	12000	14000
BSI Gain	1100	1350
VBAT Offset	2635	2755
VBAT Gain	14900	15900
VCHAR Gain	N/A	N/A
IBAT (ICal) Gain	7750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

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4 — RF Troubleshooting

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General RF troubleshooting

Introduction to RF troubleshooting

Most RF semiconductors are static discharge sensitive

ESD protection must be applied during repair (ground straps and ESD soldering irons).

Pre-baking

These parts are moisture sensitive and must be pre-baked prior to soldering:

- VAPAUS RFIC (N7500)
- TX FEM (N7520)
- WCDMA PA (N7540)
- Aura DC/DC converter (N7560)

Discrete components

In addition to the key components, there are a number of discrete components (resistors, inductors and capacitors) for which troubleshooting is done mainly by *visual inspection*.

Capacitors: check for short circuits.

Resistors: check value with an ohm meter.

Note: In-circuit measurements should be evaluated carefully.

Measuring equipment

All measurements should be done using:

- Module jig MJ-191
- Flash adapter FS-97
- Control unit CU-4/Interface adapter SS-46
- An oscilloscope for low frequency and DC measurements. Recommended probe: 10:1, 10MOhm/8pF.
- A radio communication tester including RF generator and spectrum analyser, for example Rohde & Schwarz CMU200. (Alternatively a spectrum analyser and a RF generator can be used. However, some tests in this guide are not possible to perform if this solution is chosen).

  Note: A mobile phone WCDMA transmitter should never be tested with full TX power (only if it is possible to perform the measurement in a good RF-shielded room). Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.

  Note: All measurements with an RF coupler should be performed in an RF-shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, testing at frequencies of nearby base stations should be avoided.

Level of repair

The scope of this guideline is to verify functionality of the cellular RF block without removing RF shield.

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RF key components

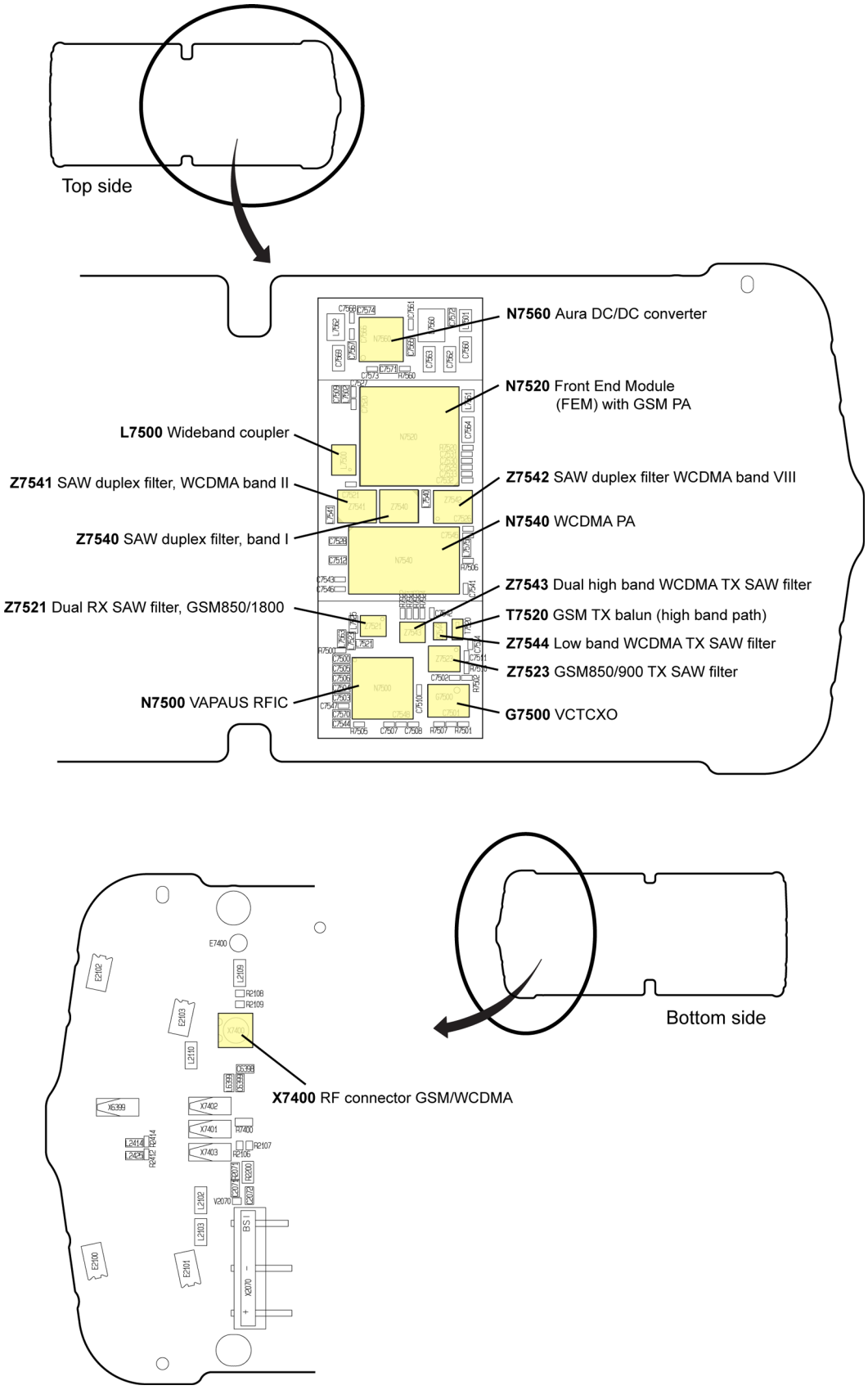

Figure 35 RF key components

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Auto tuning

Introduction to auto tuning

This phone can be tuned automatically.

Auto tune is designed to align the phone's RF part easier and faster. It performs calibrations, tunings and measurements of RX and TX. The results are displayed and logged in a result file, if initiated.

Hardware set up

Hardware requirements for auto tuning:

- PC (Windows 2000/XP) with GPIB card
- PK-1/PDK-1 service dongle
- Power supply
- Product specific module jig
- Cables: RF cable XRS-6, USB cable, GBIP cable and MBUS cable DAU-9S
- Signal analyser (TX), signal generator (RX) and RF-splitter or one device including all.

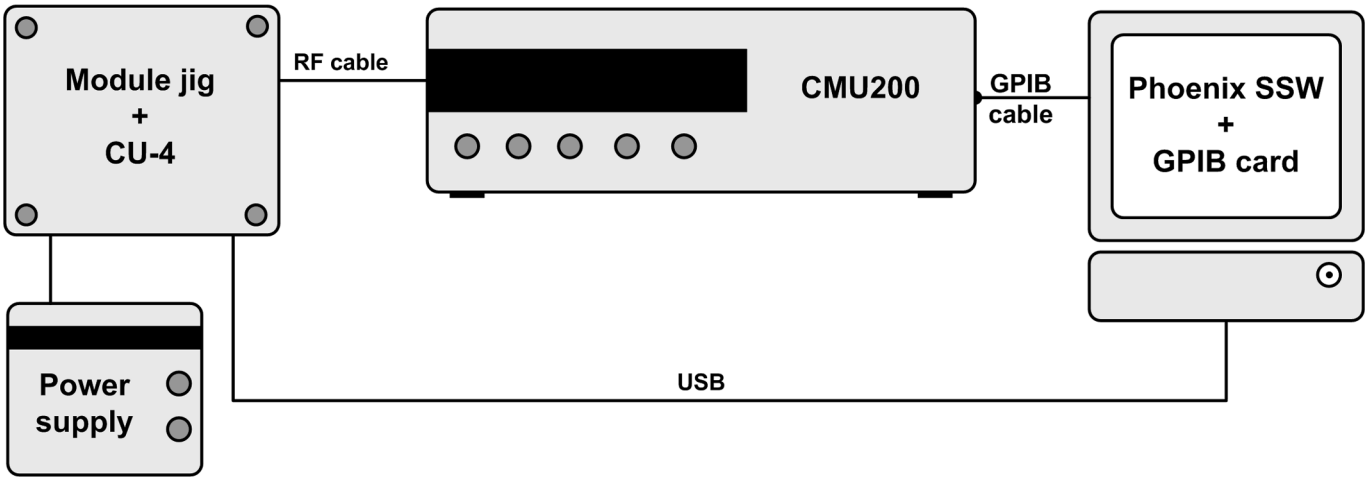

Figure 36 Auto tuning concept with CMU200

Auto tuning procedure

Prerequisites

Install the phone-specific data package, e.g. *Nokia_firmware_RM_368_Americas_10.1.069_v1.00.exe*.

The data package defines the phone-specific settings and supports non-signaling tests (RF FINUI Tests). The External Phoenix version must be 2008.34.10.36039 or newer.

Steps

1. Make sure the phone (in the jig) is connected to the equipment. Else, some menus will not be shown in Phoenix.
2. Go to loss settings by selecting **Tuning (Alt_U)→SET LOSS** from the menu.
3. Set the loss between CMU200 and the phone. (Total loss = cable + jig)
4. Go to auto tuning by selecting **Tuning (Alt_U)→Auto-tune (Alt_A)** from the menu.
5. Start auto tuning by clicking the **Tune** button.

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Self test troubleshooting

Phoenix self test troubleshooting

Context

Always start the troubleshooting procedure by running the Phoenix self tests. If a test fails, please follow the diagram below.

If the phone is dead and you cannot perform the self tests, go to Dead or jammed device troubleshooting (page 4–7) in chapter 3, Baseband troubleshooting and manual tuning guide.

Note: Self tests are recommended to be made when phone is in jig and a 50Ω load connected to the RF connector. Otherwise power tests may fail depending on antenna load

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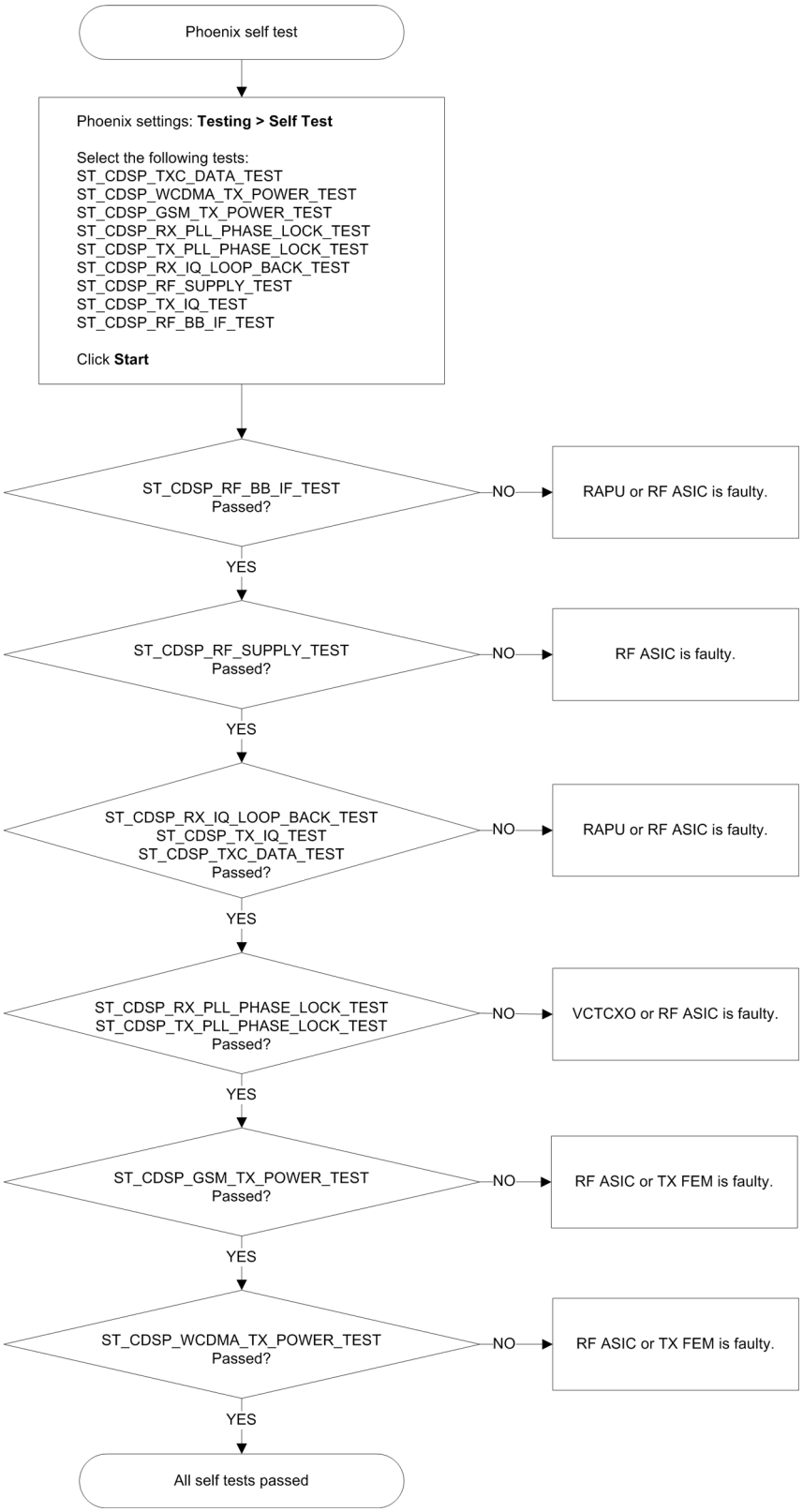
Troubleshooting flow



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Receiver troubleshooting

Introduction to receiver (RX) troubleshooting

RX can be tested by making a phone call or in local mode. For the local mode testing, use Phoenix service software.

The main RX troubleshooting measurement is RSSI reading. This test measures the signal strength of the received signal. For GSM RSSI measurements, see section GSM RX chain activation for manual measurements/ GSM RSSI measurement (page 4–10) . For a similar test in WCDMA mode, see section WCDMA RSSI measurement (page 4–13).

The RX path for GSM and WCDMA are using the same filters in some bands. Please refer to RM-368 RF components reference (page 4–27) for details.

GSM RX chain activation for manual measurements/GSM RSSI measurement

Prerequisites

Make the following settings in signal generator and Phoenix service software:

Setting	GSM850	GSM900	GSM1800	GSM1900
Phoenix Channel	190	37	700	661
Signal generator to antenna connector	881.46771MHz (67.71kHz offset) at -60dBm	942.46771MHz (67.71kHz offset) at -60dBm	1842.86771MHz (67.71kHz offset) at -60dBm	1960.06771MHz (67.71kHz offset) at -60dBm

Steps

1. Set the phone to local mode.
2. Activate RSSI reading in Phoenix by selecting **Testing→GSM→RSSI reading** .

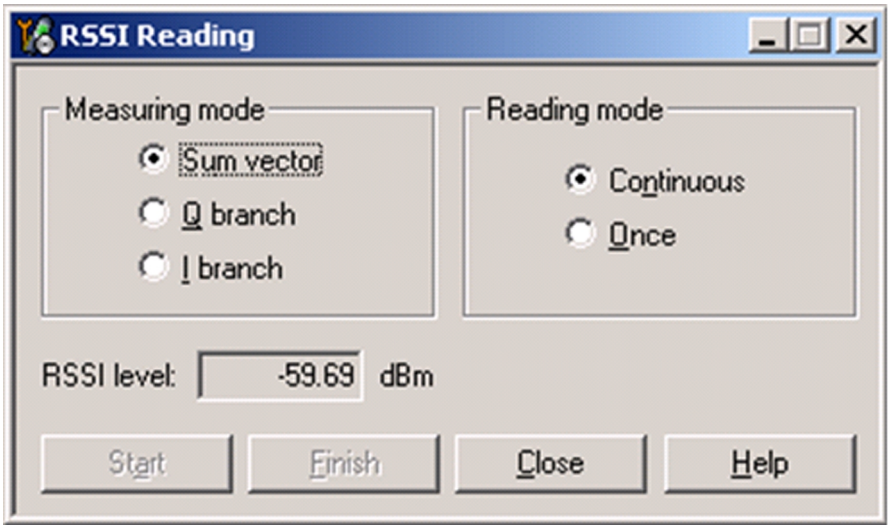

Figure 37 Phoenix RSSI Reading window

Results

The reading should reflect the level of the signal generator (minus losses) ±5dB.

When varying the level in the range -30 to -102dBm the reading should then follow within ±5dB.

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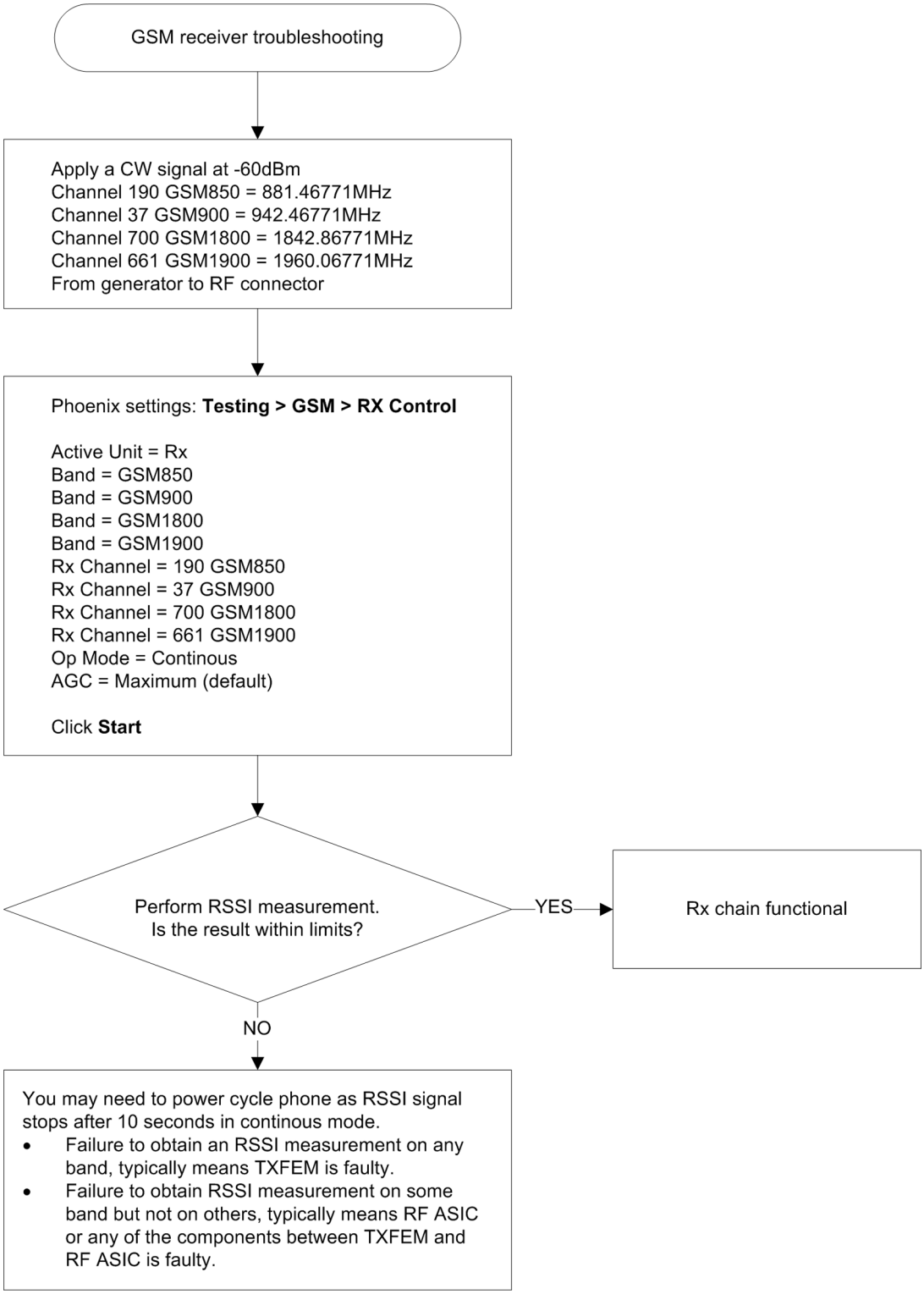
GSM receiver troubleshooting flowchart

Troubleshooting flow



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WCDMA RX chain activation for manual measurement

Steps

1. In Phoenix, select **Testing→WCDMA→Rx Control** . The Phoenix Rx Control window opens.

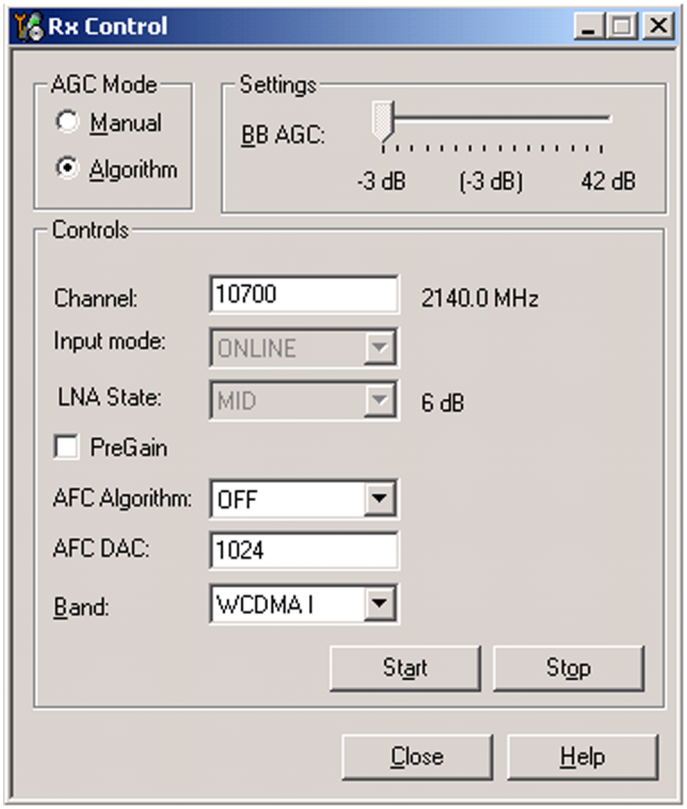

Figure 38 Phoenix Rx Control window with sample settings (WCDMA band I)

2. Make settings for the band to be tested according to the following table:

Band to be tested	Phoenix Channel	Signal generator to antenna connector
WCDMA I	10700	2141.0MHz
WCDMA II	9800	1961.0MHz
WCDMA VIII	3013	943.6MHz

3. Make the following general settings (the same values for all bands):

Setting	Value
AGC Mode	Algorithm
AFC Algorithm	OFF
AFC DAC	1024

4. Click **Start** to activate the settings.

   If the settings are changed later on (for example, change of channel) you have to click **Stop** and **Start** again.

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Note: Clicking **Stop** also disables TX control if it was active.

WCDMA RSSI measurement

Prerequisites

WCDMA RX must be activated before RSSI can be measured. For instructions, please refer to WCDMA RX chain activation for manual measurement (page 4–12).

Connect signal generator to RF connector and use appropriate frequency for each channel.

Steps

1. In Phoenix select **Testing→WCDMA→RX Power measurement** . The Rx Power Measurement window opens.

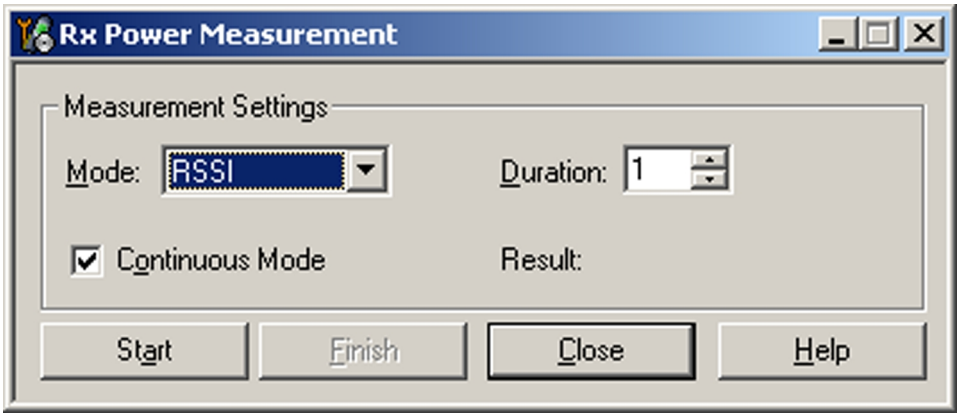

Figure 39 Phoenix Rx Power Measurement window

2. In the RX Power measurement window, select:
   - Mode: RSSI
   - Continuous mode
3. Click **Start** to perform the measurement.

   Note: WCDMA RSSI measurement is accurate only with WCDMA modulated signal.

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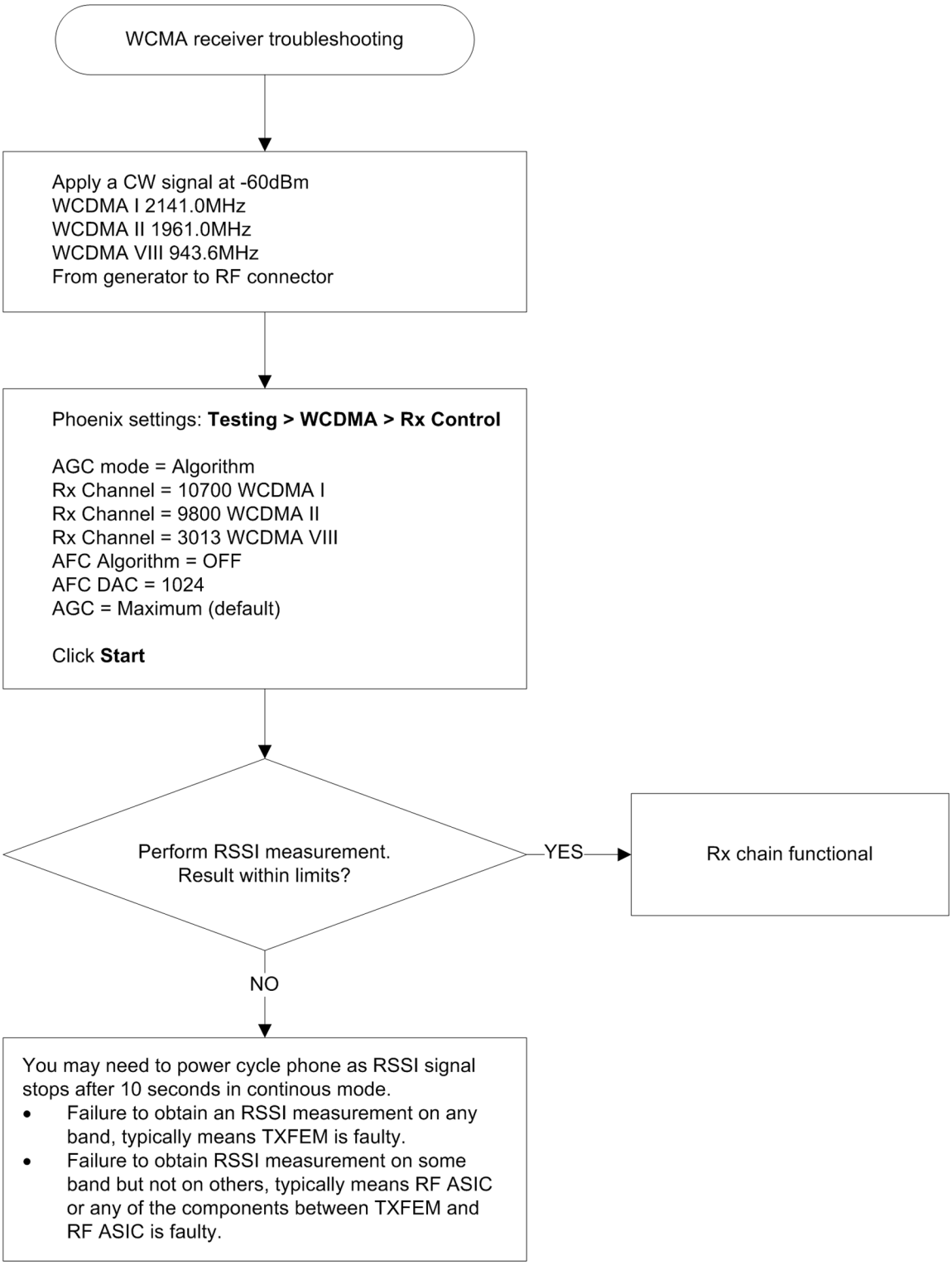
WCDMA receiver troubleshooting flowchart

Troubleshooting flow



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Transmitter troubleshooting

Introduction to transmitter (TX) troubleshooting

Please note the following before performing transmitter tests:

- TX troubleshooting requires TX operation.
- Do not transmit on frequencies that are in use!
- The transmitter can be controlled in local mode for diagnostic purposes.
- The most useful Phoenix tool for GSM transmitter testing is “RF Control”; in WCDMA transmitter testing the best tool is “TX Control”.
- Remember that re-tuning is not a fix! Phones are tuned correctly in production.
- The RX path for GSM and WCDMA are using the same filters in some bands. Please refer to RM-424 RF components reference (page 4–27) for details.

Note: Never activate the GSM or WCDMA transmitter without a proper antenna load. Always connect a 50Ω load to the RF connector (antenna, RF-measurement equipment or at least a 2W dummy load); otherwise the GSM or WCDMA Power amplifier (PA) may be damaged.

GSM transmitter troubleshooting

Steps

1. Set the phone to local mode.
2. In Phoenix, select **Testing→GSM→Rf Controls** . The RF Controls window opens.

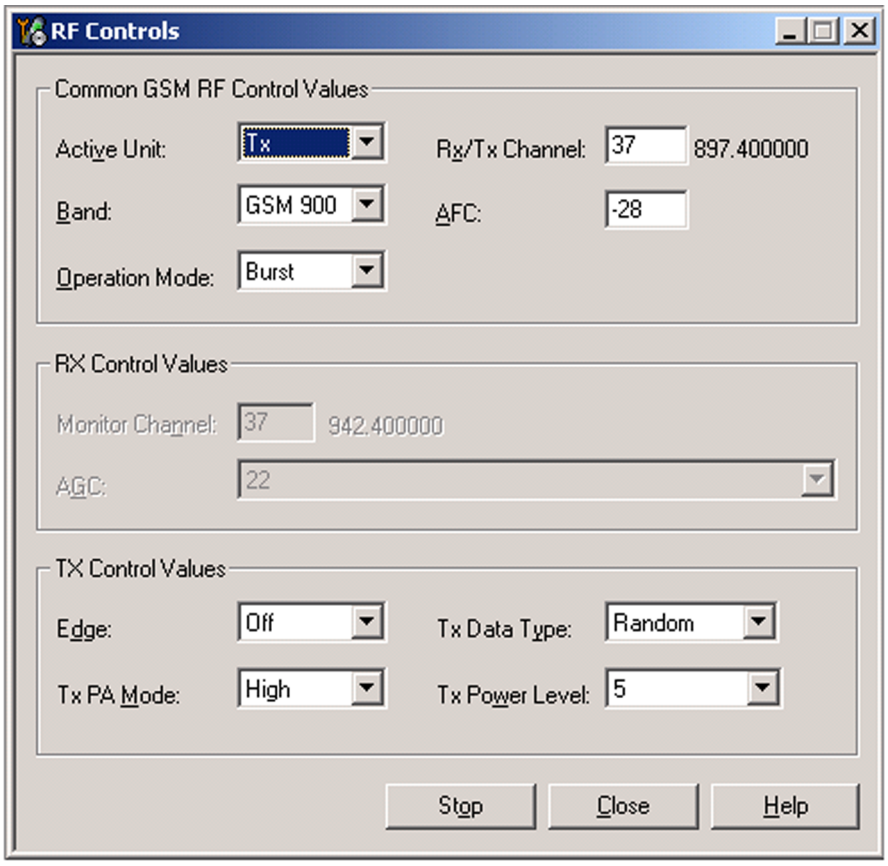

Figure 40 Phoenix RF Controls window

3. Make the following settings:

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Setting	Value
Active Unit	Tx
Rx/Tx Channel	37
Band	GSM 900
AFC	-28
Operation Mode	Burst
Edge	Off
Tx Data Type	Random
Tx PA Mode	High
Tx Power Level	5

4. Check the basic TX parameters, using a communication analyser (e.g. CMU200).
   - Power
   - Phase error
   - Modulation
   - Switching spectrum

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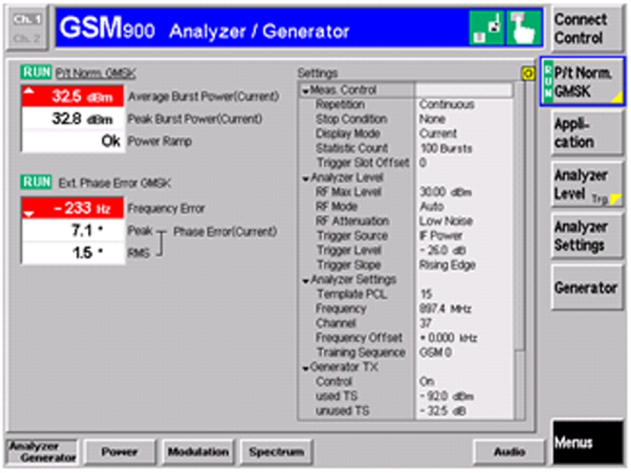
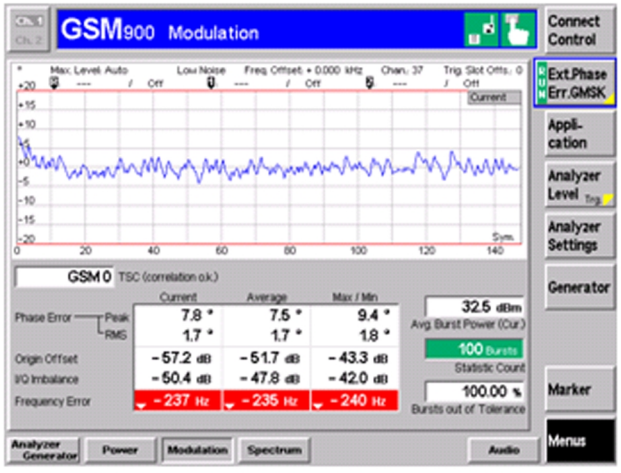
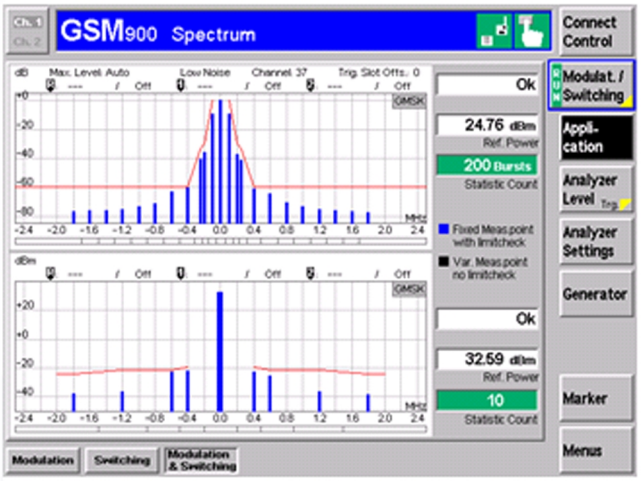
Analyser settings



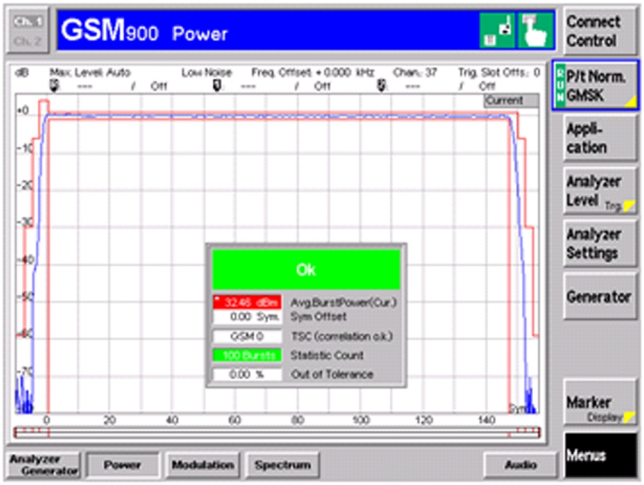
Phase error



Modulation/Switching spectrum



Power/Burst GSM/GPRS (GMSK)



Power/Burst - EDGE (8PSK)

Figure 41 Typical readings

5. Change the power level in RF controls window and make sure the power reading follows accordingly.

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Next actions

You can troubleshoot the GSM transmitter for each GSM band separately, one band at a time. If you want to troubleshoot GSM850, GSM1800 or GSM1900, change the band in the RF controls window and set the communication analyser accordingly.

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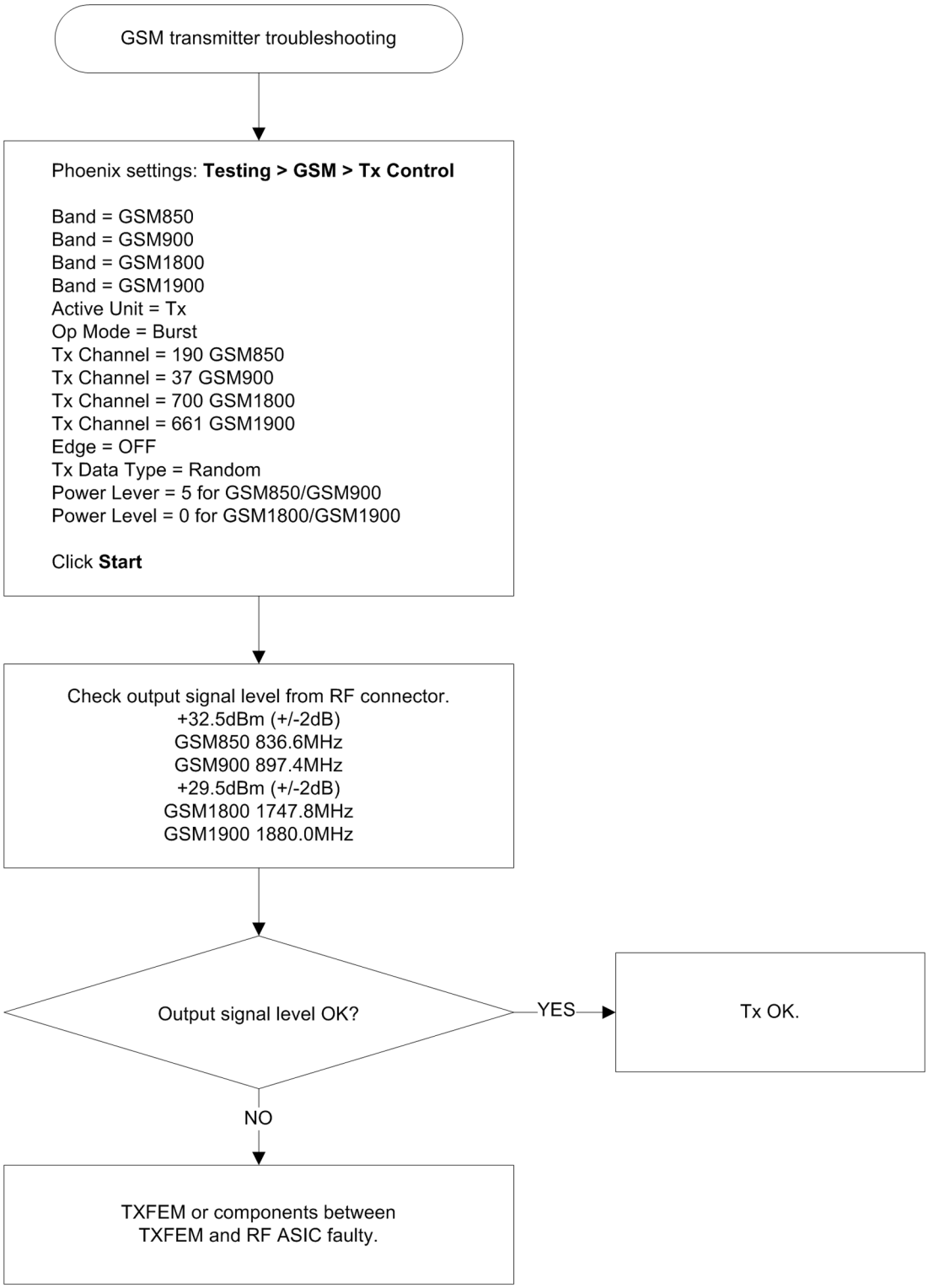
GSM transmitter troubleshooting flowchart

Troubleshooting flow



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WCDMA transmitter troubleshooting

Steps

1. Set the phone to local mode.
2. In Phoenix, select **Testing→WCDMA→Tx control** . The Tx Control window opens.

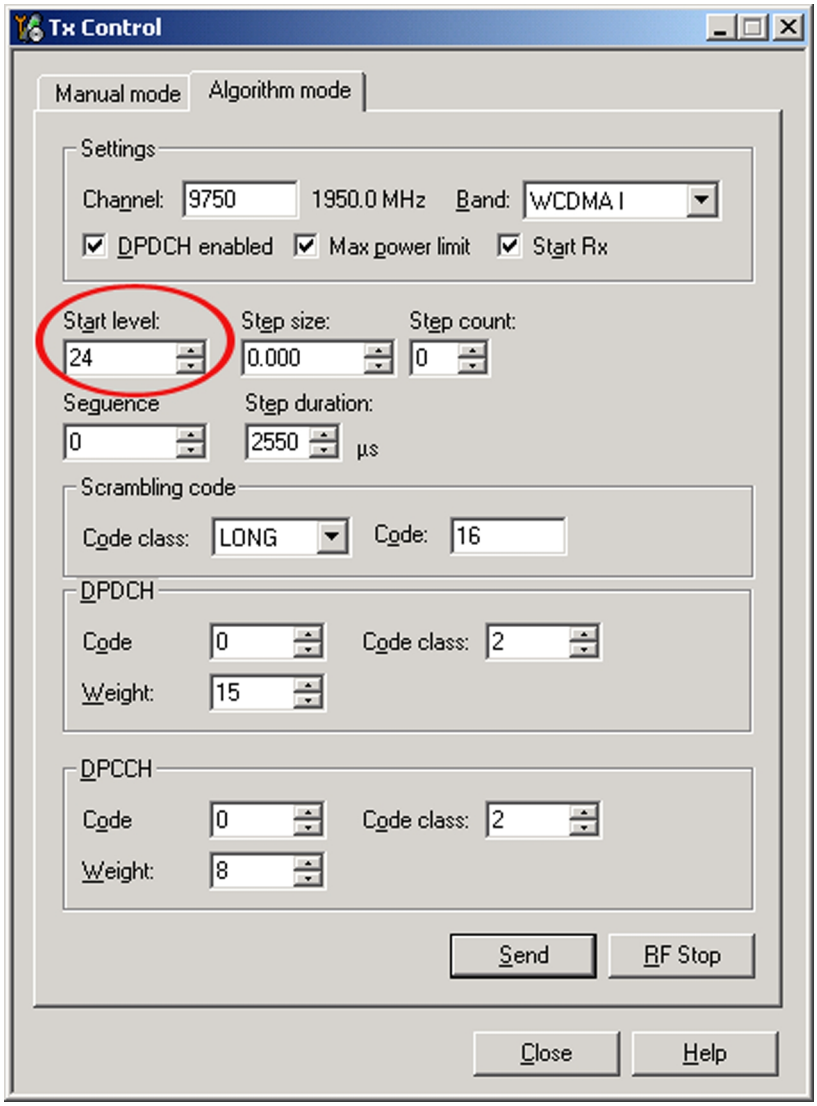

Figure 42 Phoenix WCDMA Tx control window

3. Make settings for the band to be tested, according to the following table:

Band	Channel
WCDMA I	9750
WCDMA II	9400
WCDMA VIII	2788

4. Make the following general settings (the same values for all bands). Note that Max power limit is not checked by default.

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Setting	Value
DPDCH enabled	Checked
Max power limit	Checked
Start Rx	Checked
Start level	24
Step size	0
Step count	0
Sequency	0
Step duration	2550
Code class	LONG
Code	16
DPDCH code	0
Weight	15
Code class	2
DPCCH code	0
Weight	8
Code class	2

Note: Use the **Start level** option to set the TX power level.

5. Click **Send** to enable the settings and activate TX.
   If settings are changed (eg. new channel selected), you have to click **RF Stop** and **Send** again.
6. Check the basic TX parameters using a communication analyser (e.g. CMU200).

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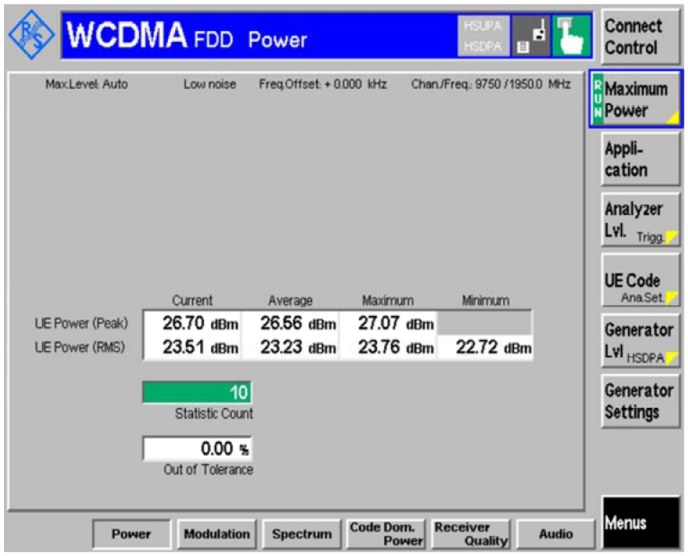
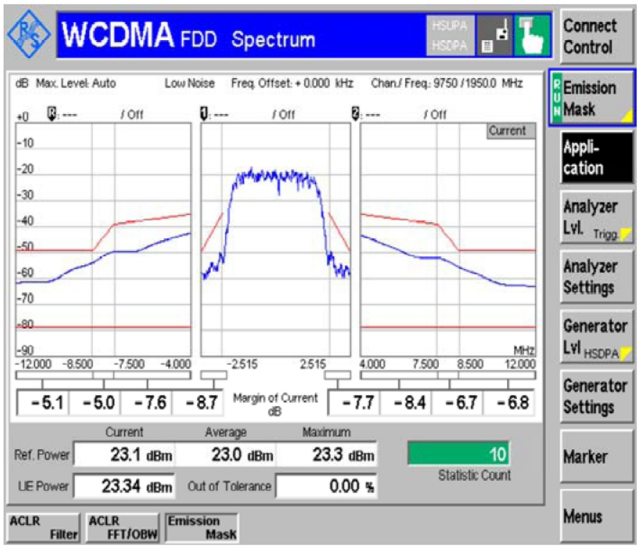
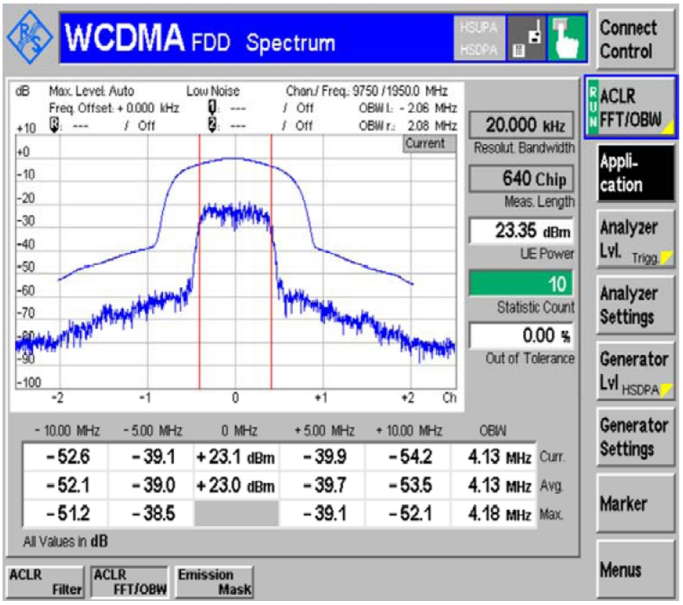
Power



Spectrum - Emission Mask



Spectrum - ACLR (FFT/OBW)



Spectrum - ACLR (Filter)

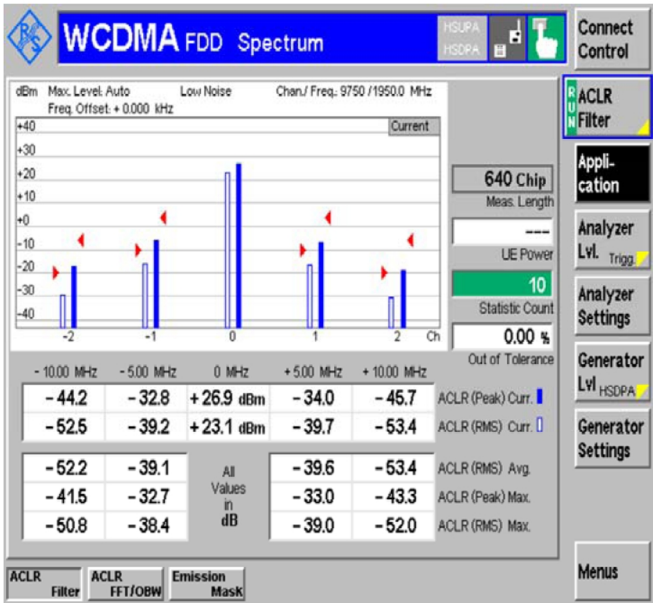


Figure 43 Typical readings

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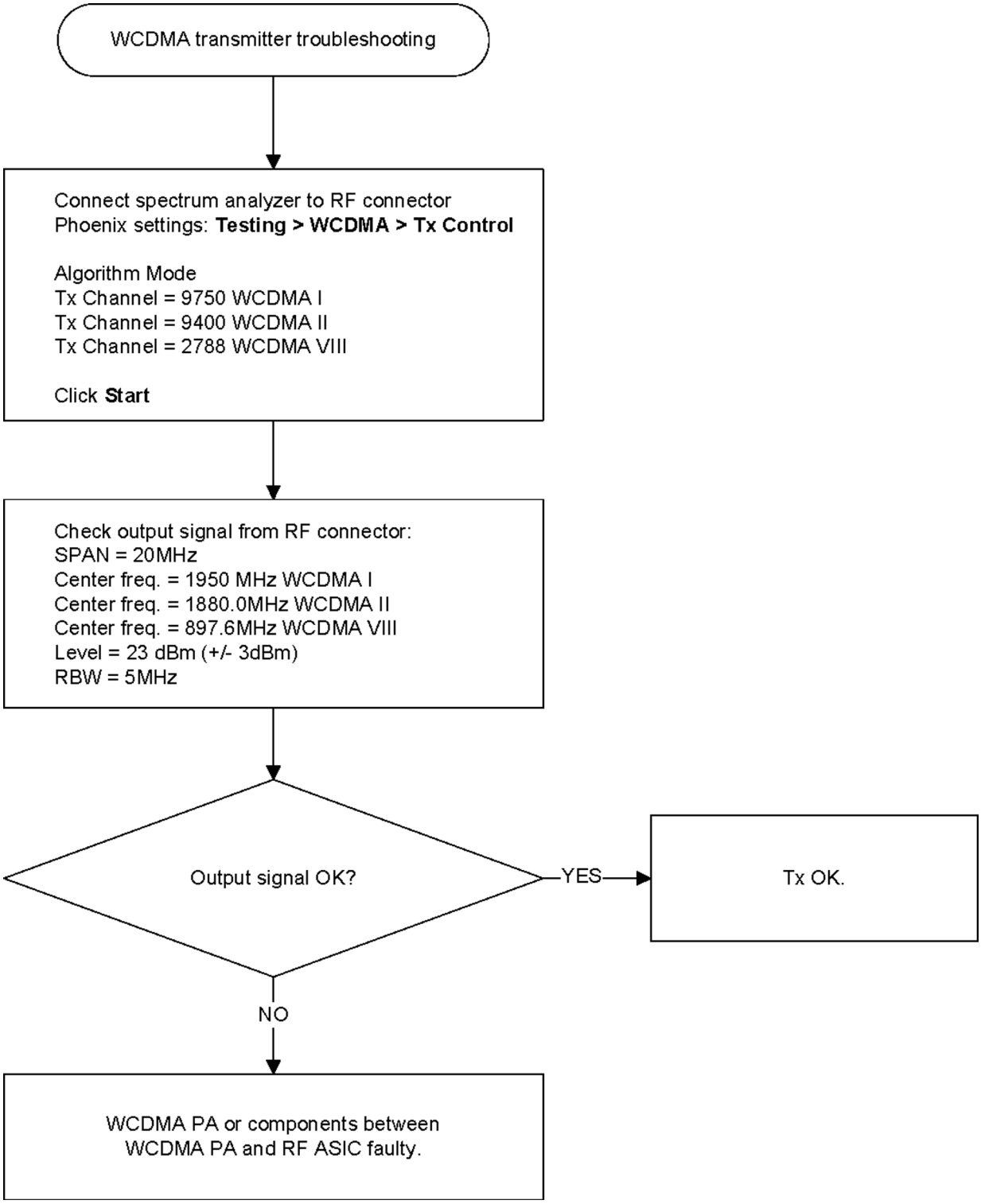
WCDMA transmitter troubleshooting flowchart

Troubleshooting flow



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Troubleshooting with RF-shield removed

Introduction

Troubleshooting instructed in the following chapter requires that the RF-shield lid is removed.

Voltage checking

Steps

1. Set up the main board in the module jig. The phone should be in local mode.
2. Check the following:

TP#	Signal name	Test point	Voltage (all bands)
1	VCTCXO (G7500) supply	C7501	2.5V
2	RFIC Vapaus (N7500) supply from DC/DC converter	C7570	2.8V
3	TXFEM (N7520) supply from DC/DC converter	C7521	1.3V-3.8V (only when transmitting and depends on output power).
4	WCDMA PA (N7540) supply from DC/DC converter	C7528	0.7V-3.1V (only when transmitting and depends on output power). The value will be 3.1V when settings as described in the note below are used.
5	Vbat at WCDMA PA (N7540)	C7512	3.7V (Vbattery)
6	Supply input to DC/DC conv	C7527	3.7V (Vbattery)

Note: When using settings as shown in the following Tx Control window, the result at TP4 should be 3.1V.

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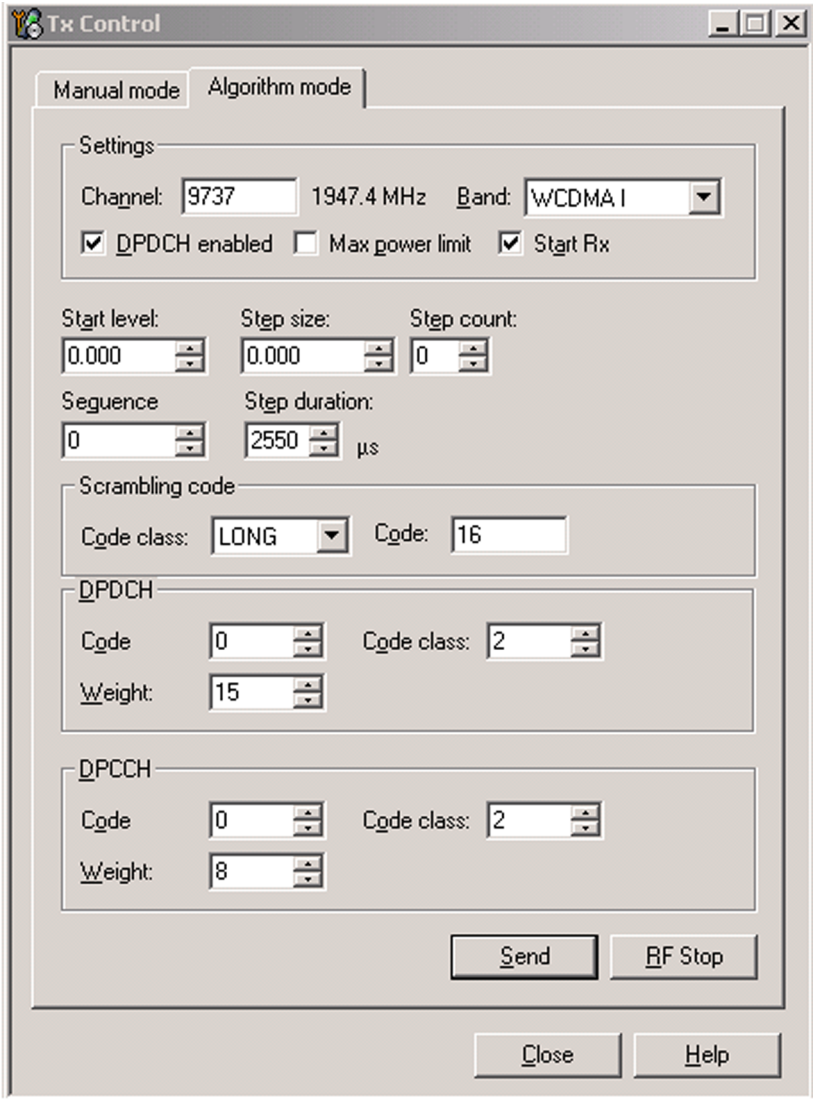

Figure 44 Phoenix WCDMA Tx Control window settings

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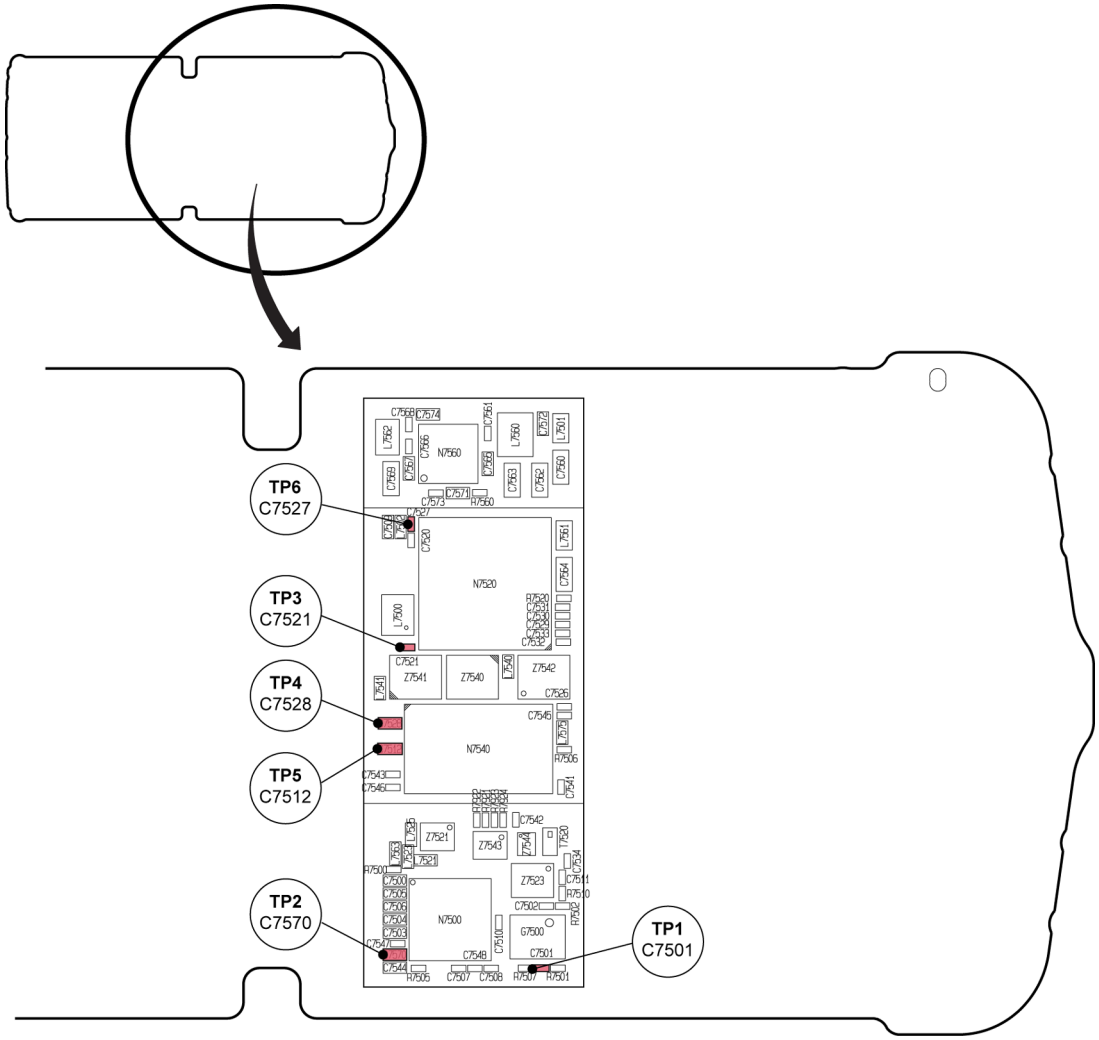

Figure 45 Test points for voltage checking

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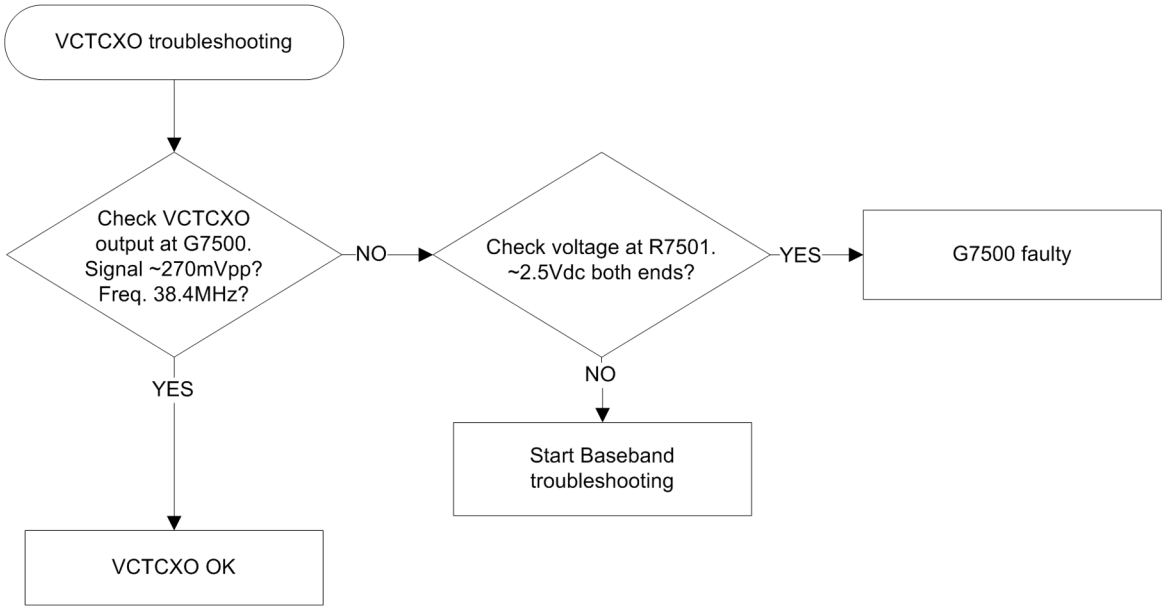
VCTCXO troubleshooting

Troubleshooting flow



RF component reference

Component reference table

This table shows the components used for the different bands. It can be used as a reference when troubleshooting which components may or may not be faulty.

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	GSM850		GSM900		GSM1800		GSM1900		WCDMA1		WCDMA2		WCDMA8	
Reference	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX
G7500	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L7500	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N7500	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N7520	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N7540										X		X		X
N7560	X	X	X	X	X	X	X	X	X	X	X	X	X	X
T7520						X		X						
Z7521	X				X									
Z7523		X		X										
Z7540							X				X	X		
Z7541									X	X				
Z7542			X										X	X
Z7543										X		X		
Z7544														X

X means that the component is used for the band in the current column.

For further reference, see Component reference schematics on the following page.

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RF block schematics

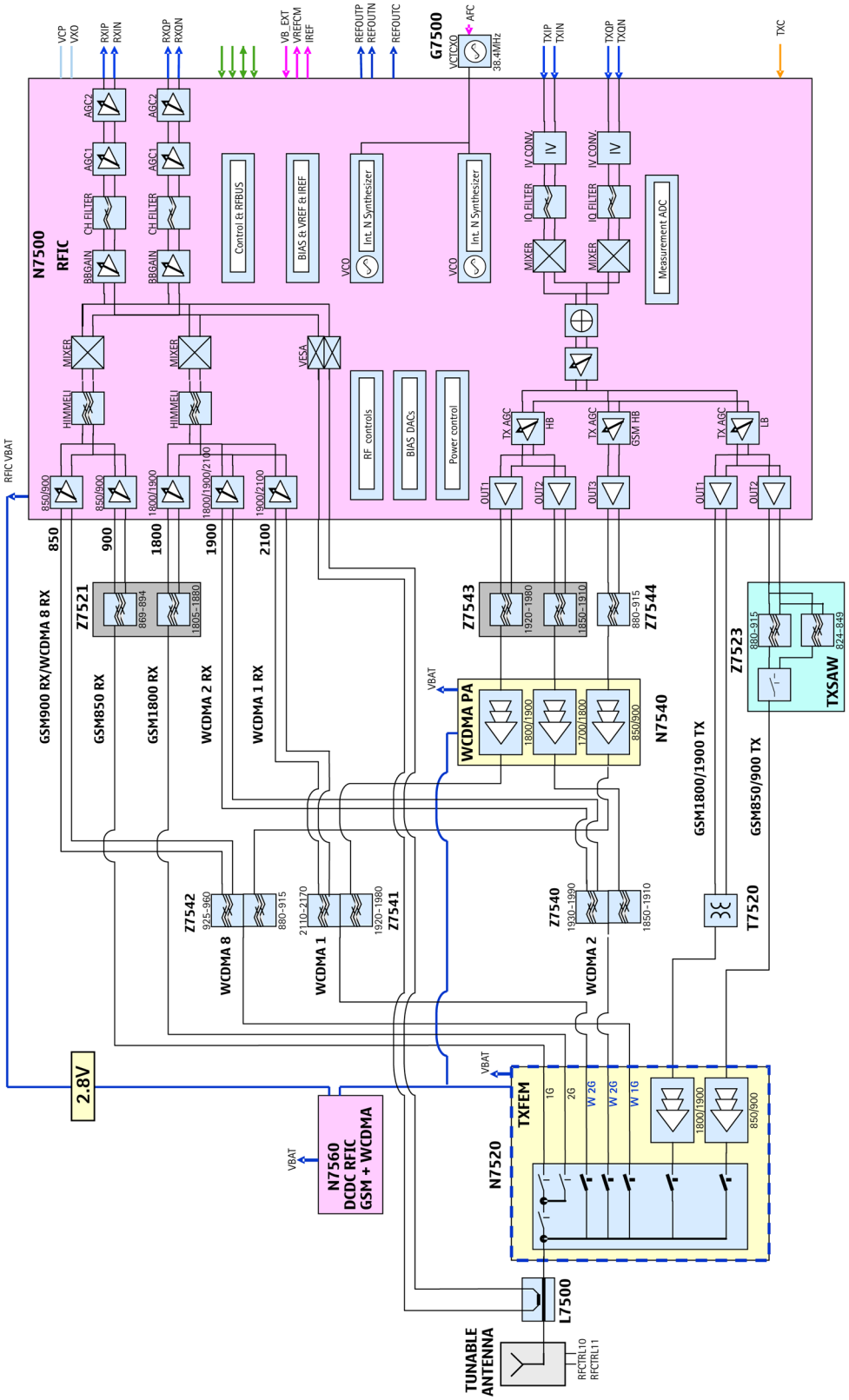

Figure 46 Component reference schematics

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Antenna

Antenna overview

The phone has two antennas, a main antenna and a GPS antenna.

The main antenna is covering the GSM and WCDMA bands along with BT. The main antenna consists of an antenna flex attached to an antenna carrier with adhesive.

The main antenna has one feed pad for GSM and WCDMA, one feed pad for BT, one contact to Mutant switch and two ground pads. All five pads connect to C-springs mounted on the main PWB.

For a description of the GPS antenna, see section GPS antenna (page 4–38).

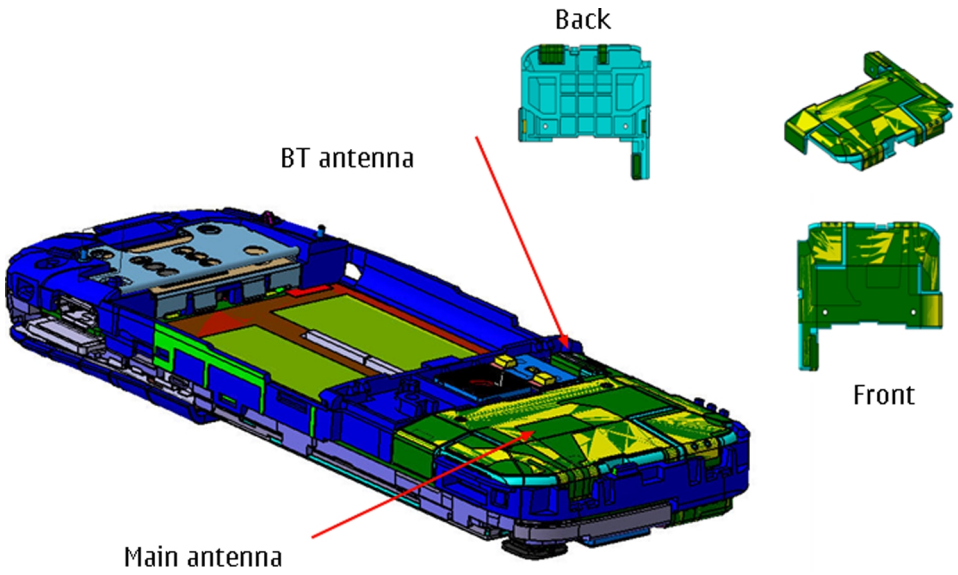

Figure 47 Main antenna

Main antenna functionality

The main antenna is functioning normally when the feed and GND pads take proper contact to the C-springs on the main PWB, and the antenna flex is visually intact.

The main antenna functionality must also be checked by measuring the transmitted power with RF coupler at GSM900 channel 124.

Antenna troubleshooting

Antenna contacts, visual check

The main antenna has one feed pad for GSM and WCDMA, one feed pad for BT, one contact to Mutant switch and two ground pads. Check that GND and feed pads take proper contact to the C-clips on the main PWB.

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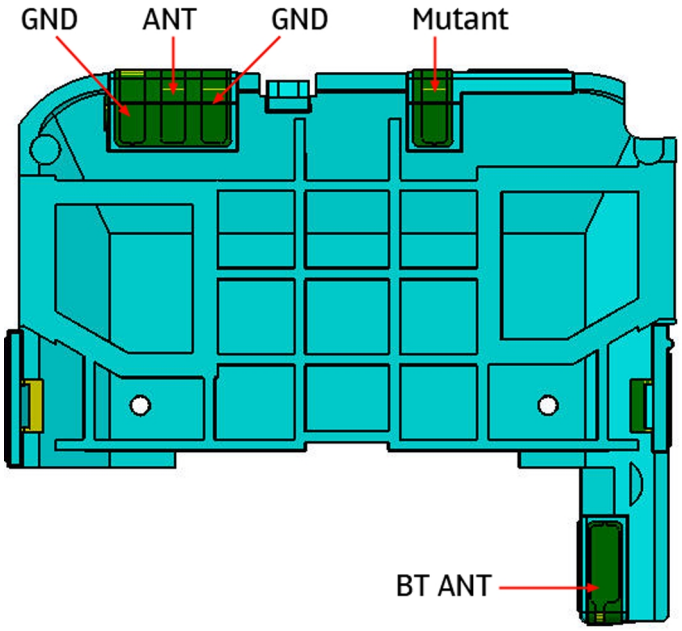

Figure 48 Antenna contacts

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5 — Camera Module Troubleshooting

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Main (back) camera troubleshooting

Taking and evaluating test pictures with main camera

When *taking* a test picture, remember the following:

- Avoid bright fluorescent light, 50/60Hz electrical network or high artificial illumination levels
- If the phone is hot, let it rest for a while before taking the picture
- Make sure the optical system is clean
- Use highest possible resolution
- Make sure the light is sufficient (bright office lightning)
- Do not take the picture towards a light source
- Hold the phone as still as possible when taking the picture
- If camera has auto focus: Pictures should be taken both at infinity ~>2m and at macro distance ~10-15 cm in order to verify auto focus functionality

When *evaluating* a test picture, remember the following:

- The center of the picture is sharper than the edges
- The image may be blurred, though it does not show in the viewfinder
- Analyse the picture from your PC monitor, full colour setting is recommended
- If possible, compare with a picture of the same motive taken with a similar Nokia device
- If camera has auto focus: Remember that the white focussing frame which appears when the camera button is pressed halfway down, must turn green for auto focus lock. If the frame turns red, the camera is not focussed!

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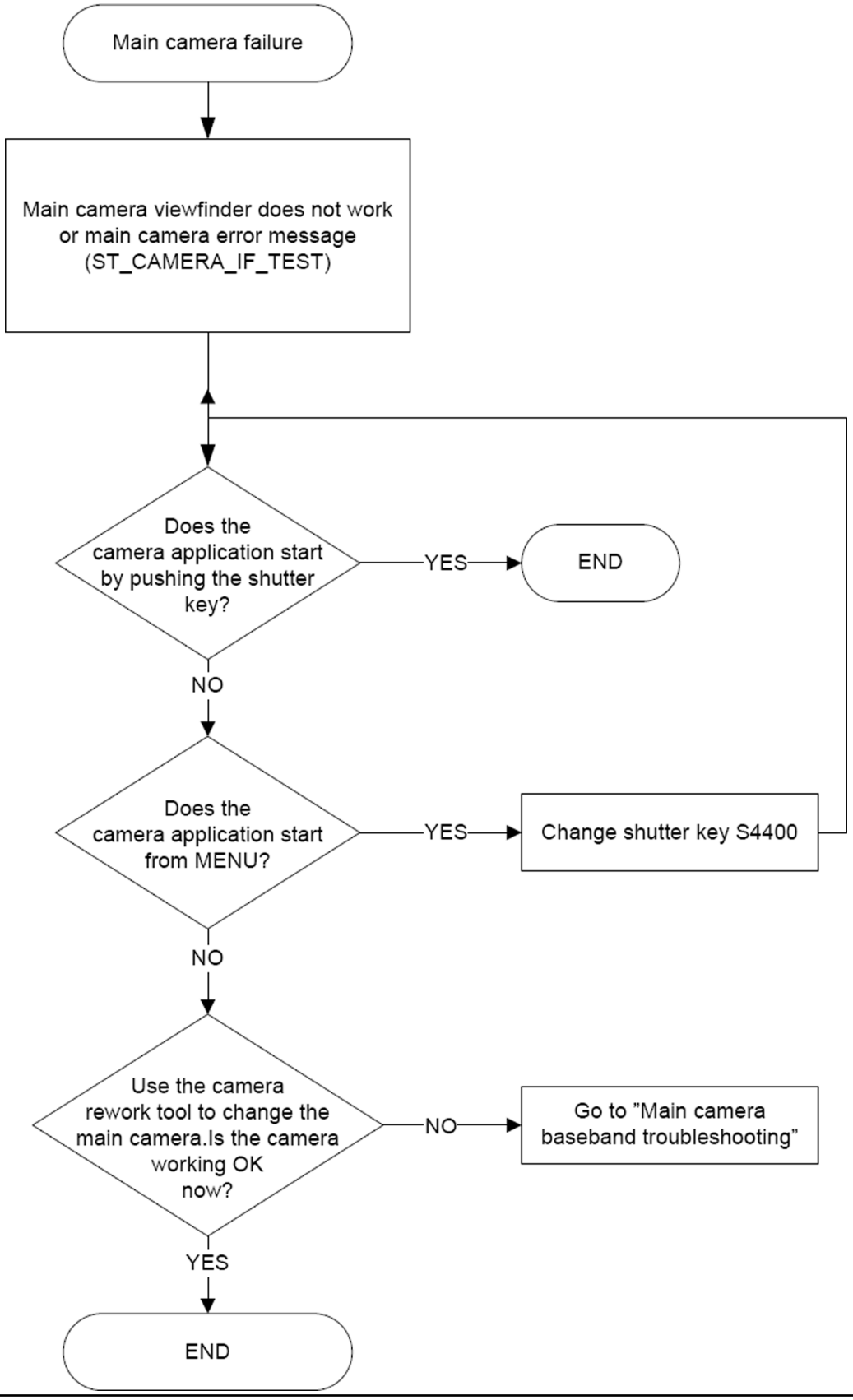
Main camera troubleshooting

Troubleshooting flow



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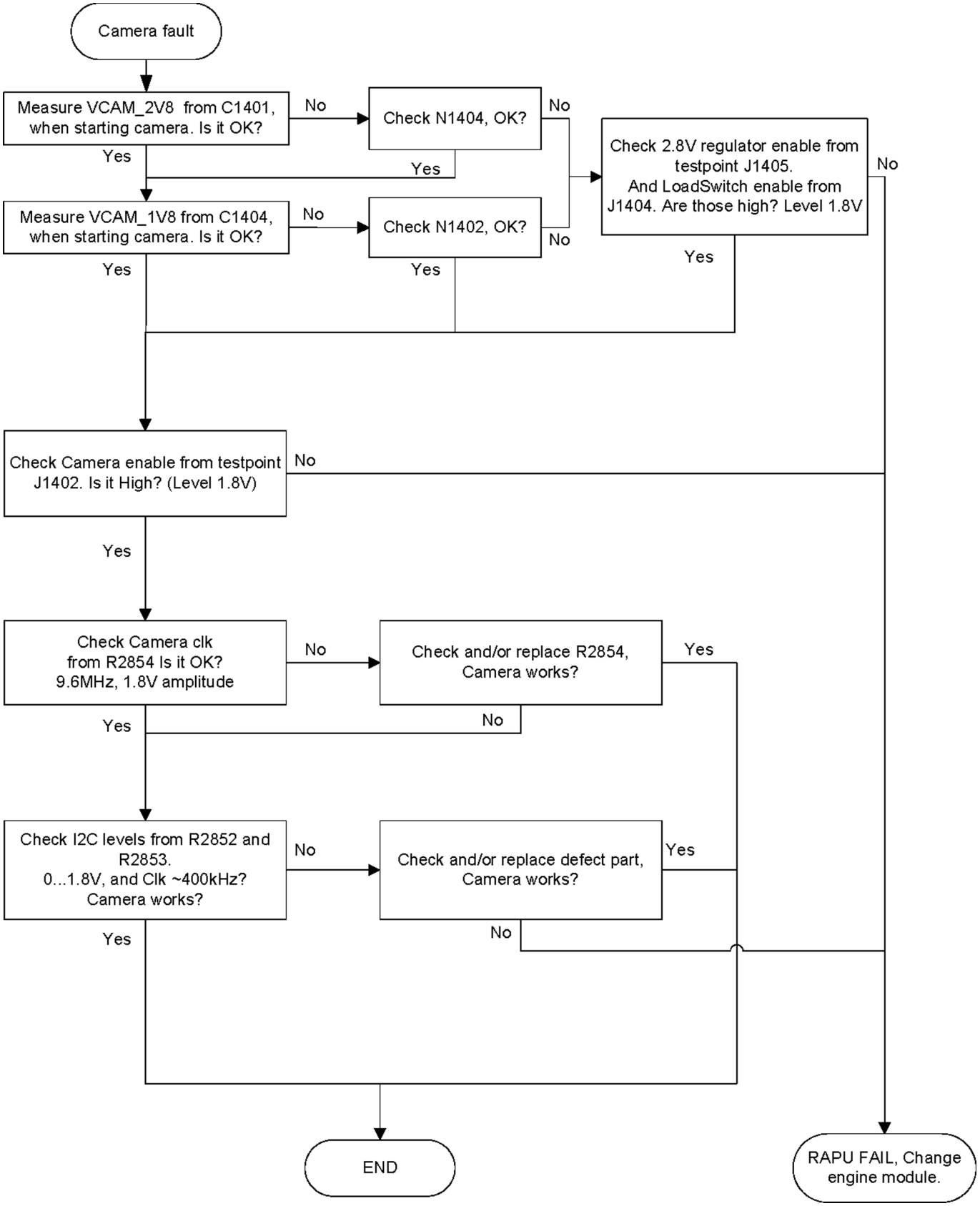
Main camera baseband troubleshooting

Troubleshooting flow



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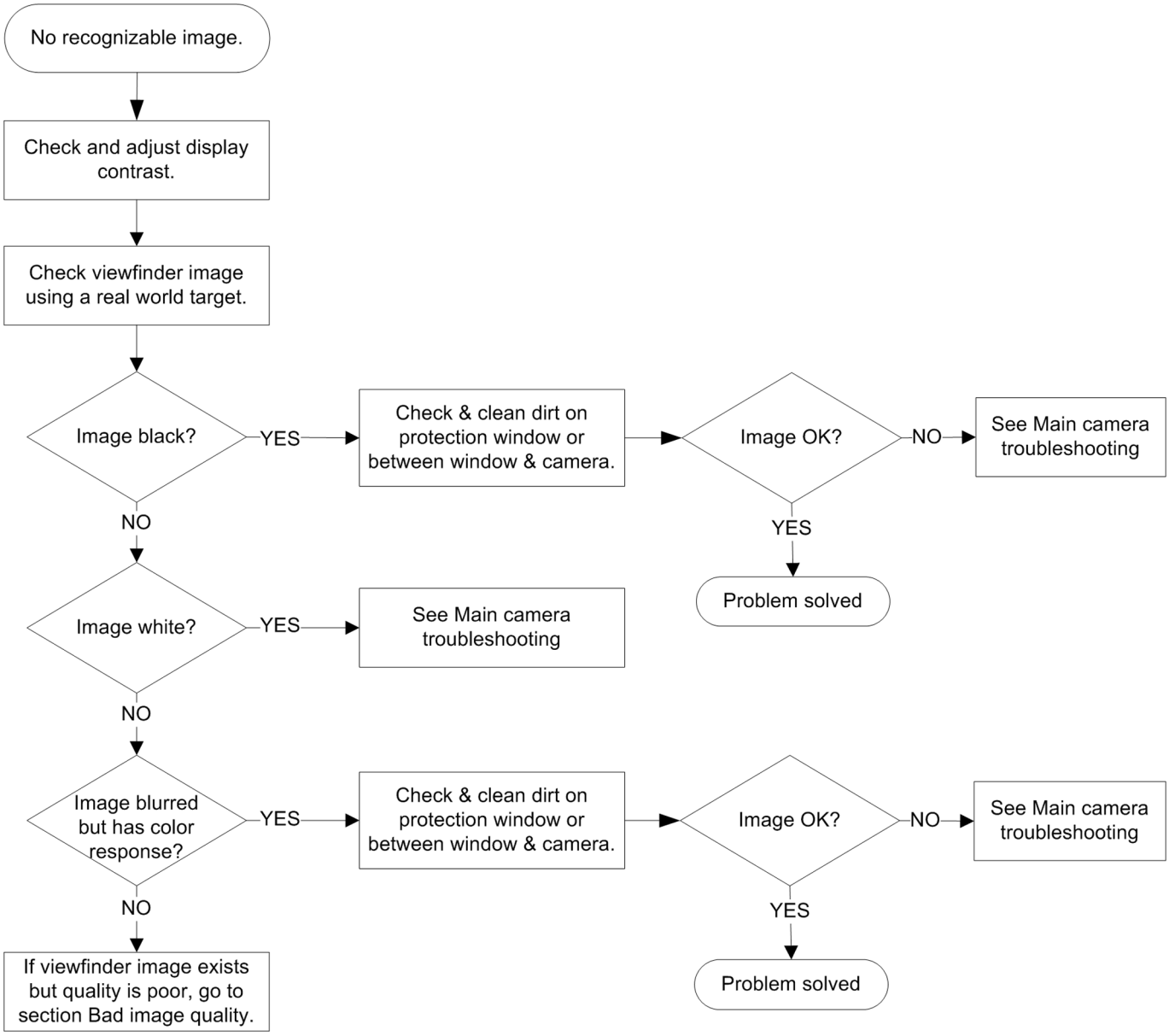
Main camera no recognizable viewfinder image troubleshooting

Troubleshooting flow



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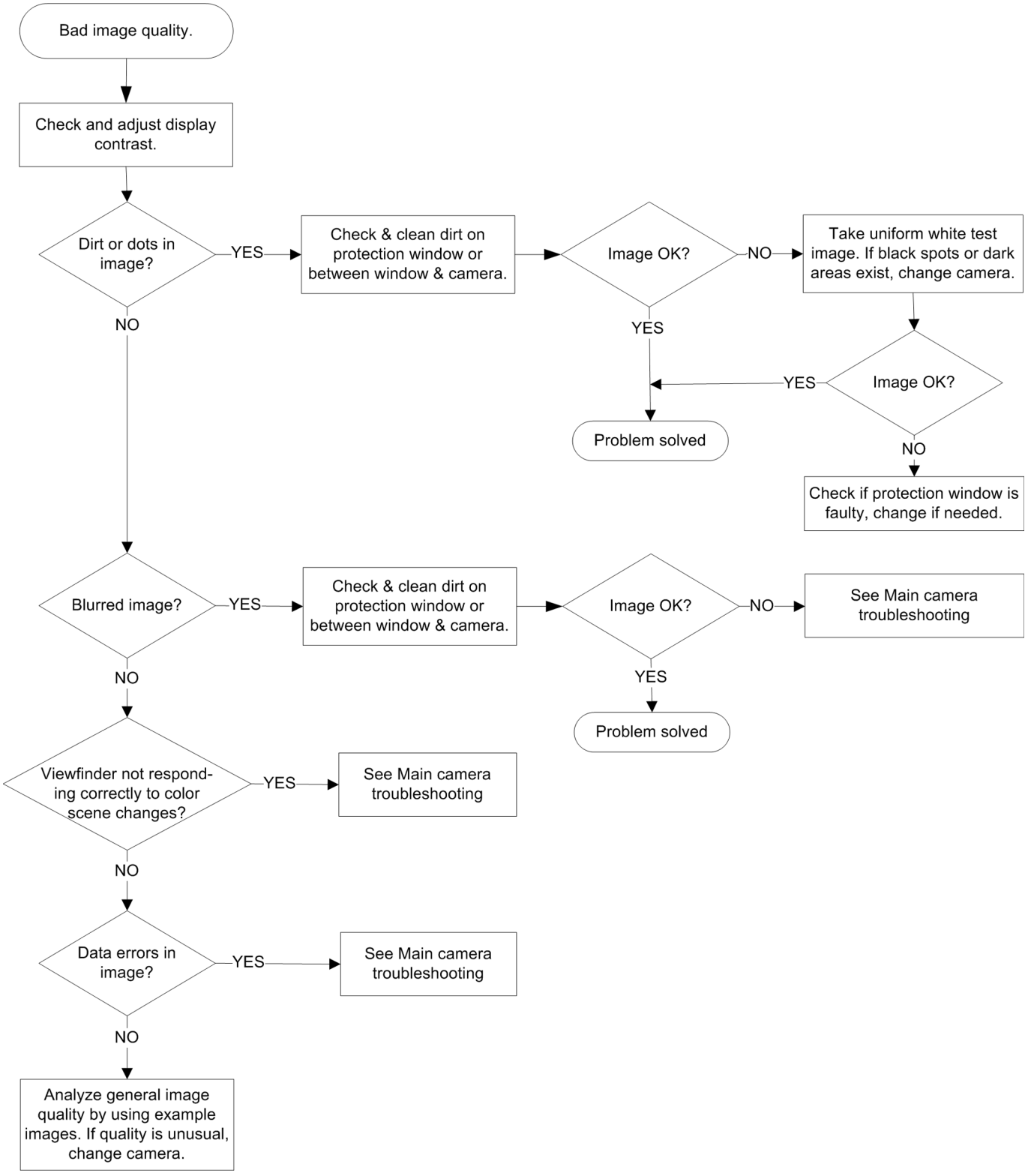
Main camera bad image quality troubleshooting

Troubleshooting flow



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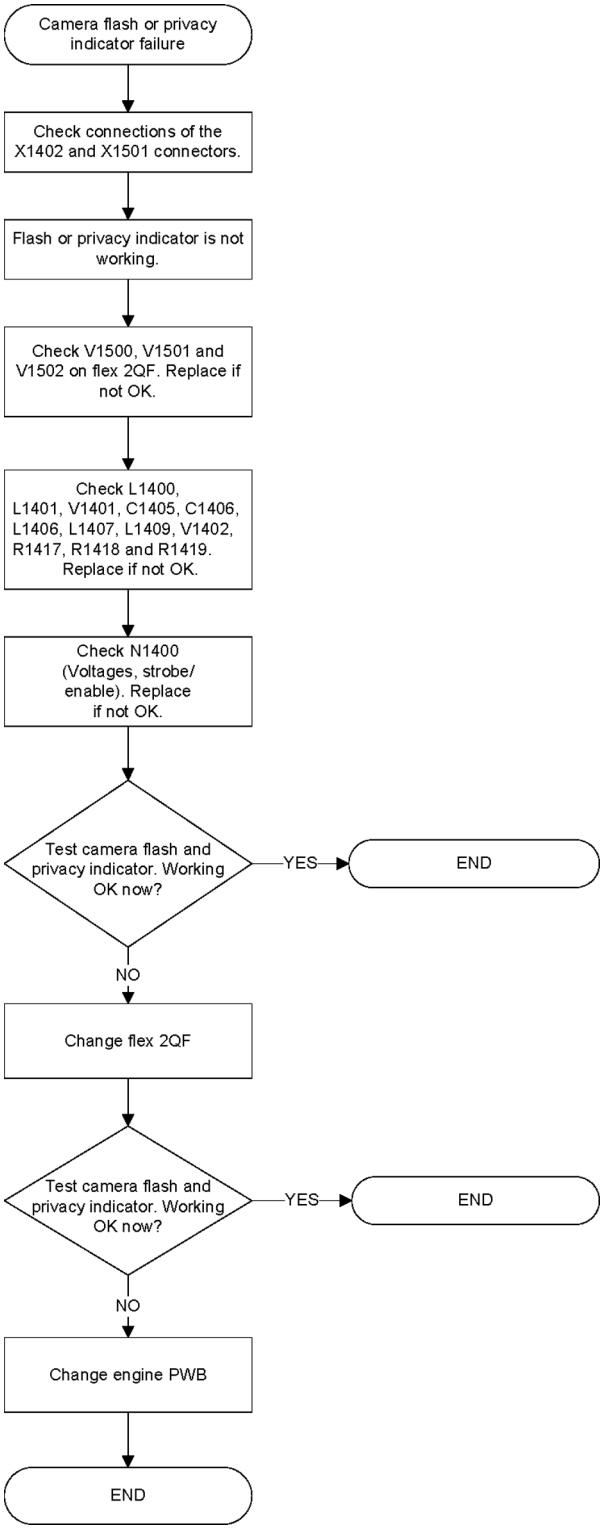
Camera flash and privacy indicator troubleshooting

Context

Note: Before checking flash functionality, make sure that the main camera is working ok.

Troubleshooting flow



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Secondary (front) camera troubleshooting

Evaluating videocall picture quality from secondary camera

When testing the picture quality of a videocall, remember the following:

- Avoid bright fluorescent light, 50/60Hz electrical network or high artificial illumination levels
- Make sure the optical system is clean
- Make sure the light is suffiecient (bright office lightning)
- Do not take the picture towards light source
- Hold the phone as still as possible when evaluating the video call image quality.
- Distance should be approximately 40 cm

When *evaluating* the picture quality of a video call, remember the following:

Note: Always use the "troubled" phone when evaluating a picture in a video call. Do not evaluate the picture on the receiving phone.

- The center of the picture is sharper than the edges
- If possible, compare with the picture on another Nokia device in a videocall, and of the same motive.

Secondary camera hardware troubleshooting

Troubleshooting flow

Note: Phone must be in a video call for the secondary camera to be active.

Note: Always use the "troubled" phone when evaluating a picture in a video call. Do not evaluate the picture on the receiving phone.

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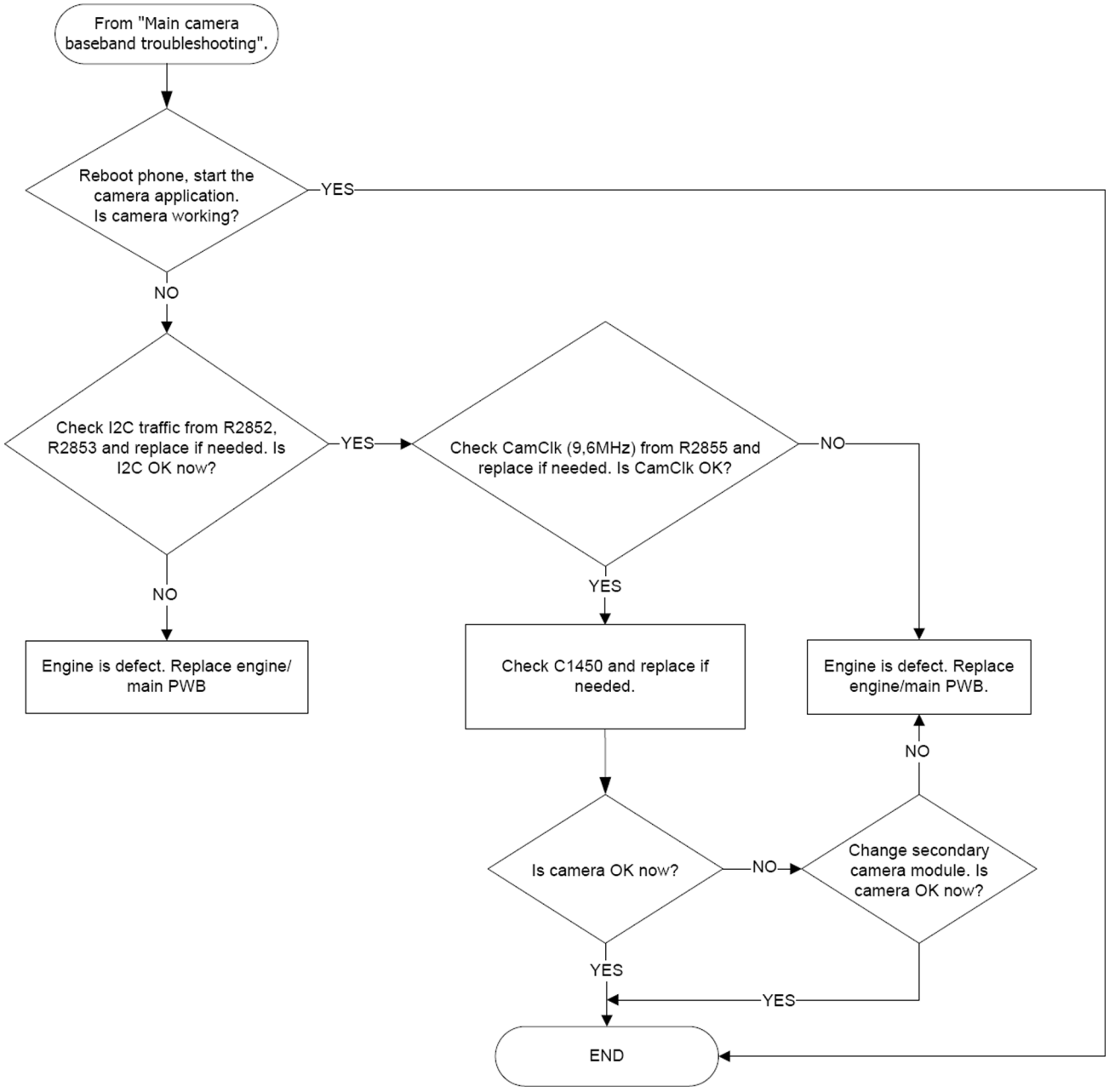

Secondary camera bad image quality troubleshooting

Context

Note: Phone must be in a video call for the front camera to be active.

Note: Always use the "troubled" phone when evaluating a picture in a video call. Do not evaluate the picture on the receiving phone.

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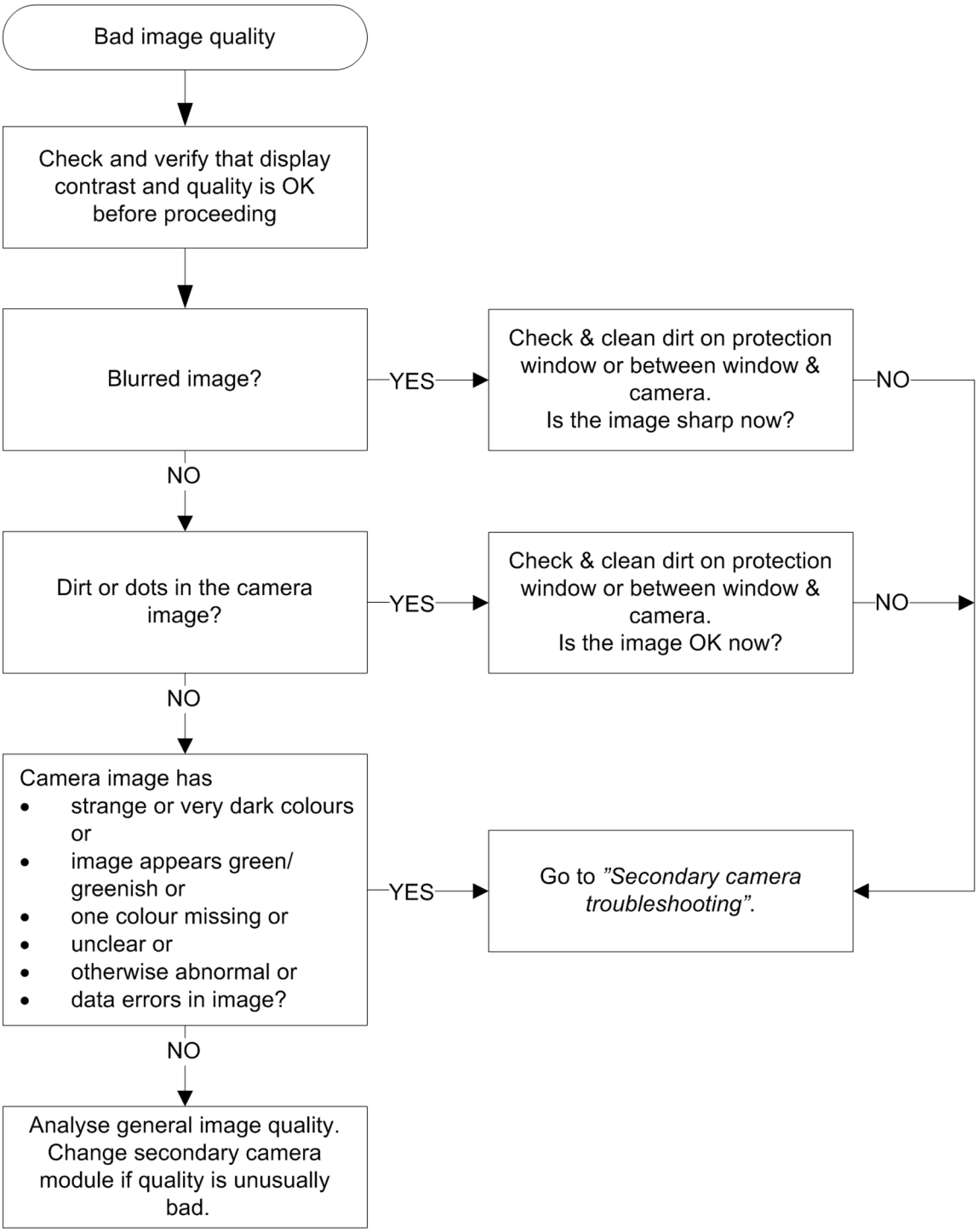
Troubleshooting flow



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6 — System Module

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Introduction

Phone description

RAPU is the main digital baseband ASIC in the phone. It contains functionality for both WCDMA and GSM EDGE. GAZOO (N2200) is the main audio and energy management controller for the phone.

Key components

Function	Description	Item ref
Engine module FPC	2QM	
Flash FPC	2QF	
Keyboard FPC	2QH	
Baseband ASIC	EM ASIC GAZOO	N2200
RF ASIC	VAPAUS	N7500
Processor	RAPU	D2800
GSM PA	Front end module (FEM), quad band	N7520
WCDMA PA		N7540
Oscillators	VCTCXO Balun GSM	G7500 T7520
Memory	Combo 1G DDR + 2G M3 (stacked with RAPU)	D3000
Back-up battery	RTC back-up battery 311	G2200
Bluetooth	BTFMRDS2.2 module	N6000
FM radio	BTFMRDS2.2 module	N6000
GPS	GPS module	N6200
USB	USB transceiver	D3300
Battery	BP-6MT	
Battery connector	Tabby blade interface	X2070
MicroSD connector		X3200
MicroUSB connector		X3300
RF connector		X7505
SIM connector		X2700
Microphones	Digital microphones	B2100 B2104 B2105

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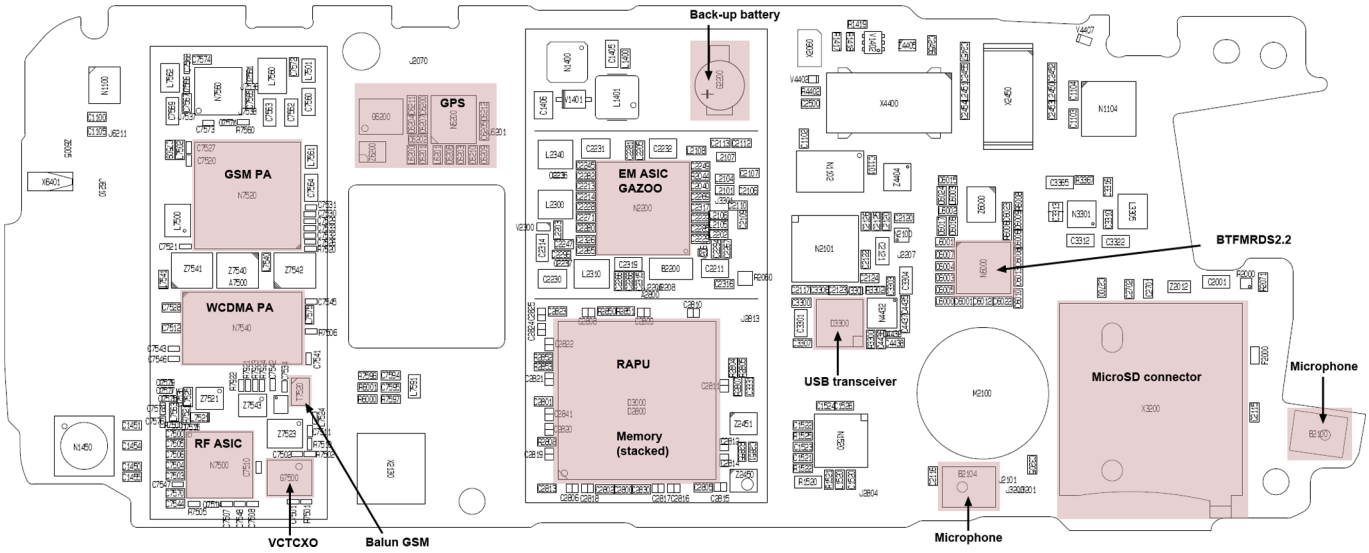
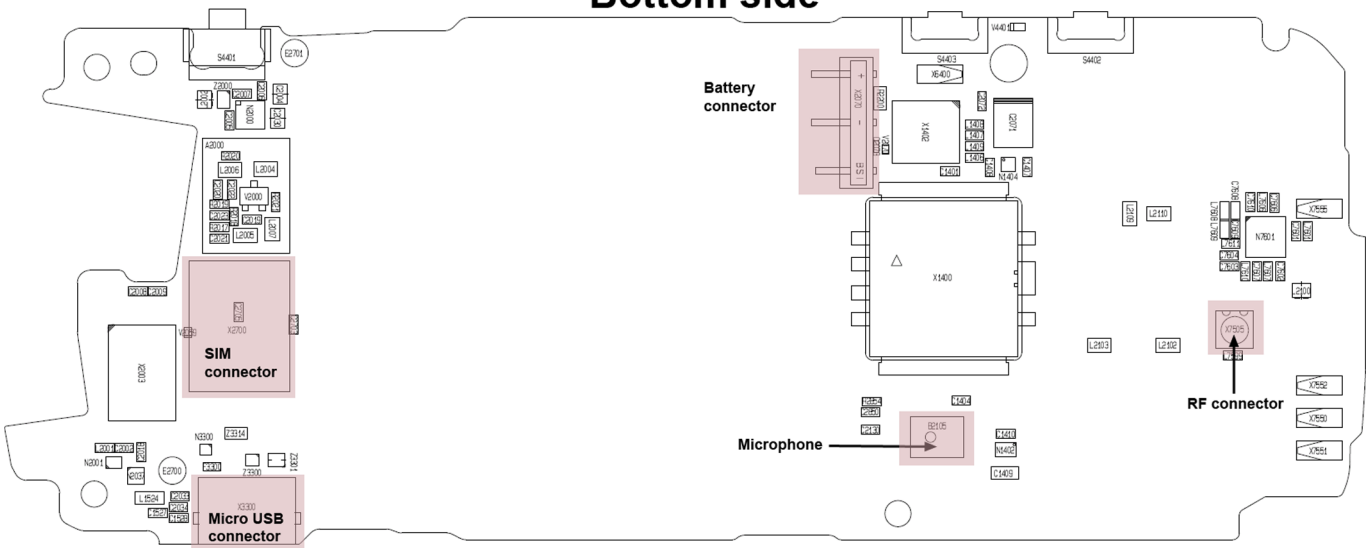
Key component placement

Top side



Bottom side



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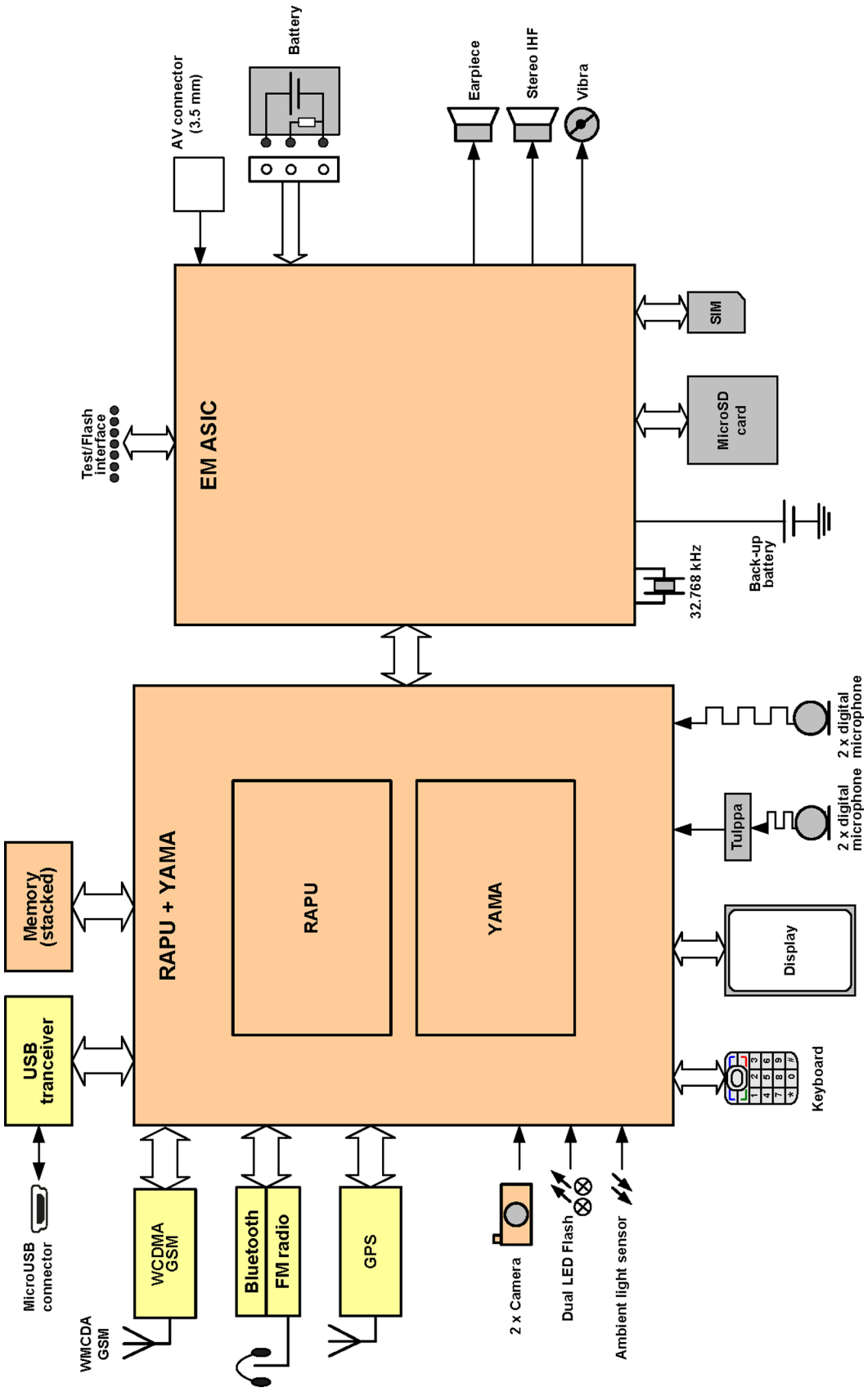
System module block diagram



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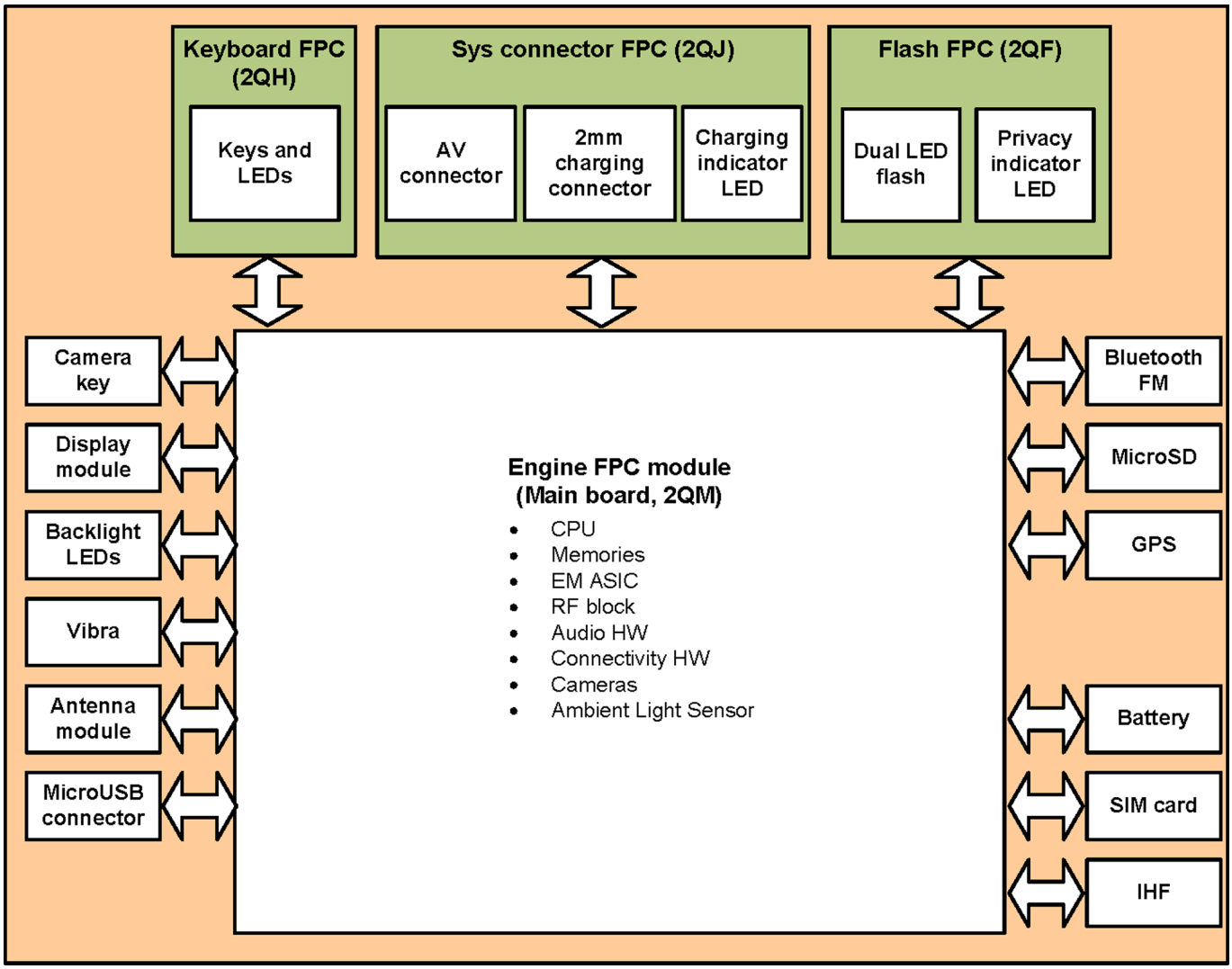
Board and module connections



Energy management

Battery and charging

BP-6MT battery

The phone is powered by a 3-pole BP-6MT battery S-pack 1050 mAh battery. The three poles are named VBAT, BSI and GND where the BSI line is used to recognize the battery capacity. This is done by means of an internal battery pull down resistor.

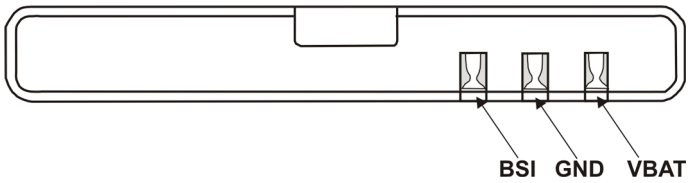


Figure 49 Battery pin order

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The battery temperature is estimated by measuring separate battery temperature NTC via the BTEMP line. This is located on the main PWB, at the place where the phone temperature is closest to the battery temperature.

Battery connector

The battery connector is a blade connector. It has three blades;

- BSI (Battery size indicator)
- GND (Ground)
- VBAT (Battery voltage)

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

Figure 50 Blade battery connector

Charging

This phone is charged through the smaller Nokia standard interface (2.0 mm plug). The wider standard charger (3.5 mm) can be used together with the CA-44 charger adapter.

Figure 51 Small (right) and wide (left) charger plugs

Charging is controlled by energy management, and external components are needed to protect the baseband module against EMC, reverse polarity and transient frequency deviation.

Normal and extreme voltages

Energy management is mainly carried out in the EM ASIC (N2200). that contains a number of regulators. In addition there are also some external regulators.

In the table below normal and extreme voltages are shown when a BP-6MT battery is used.

Table 12 Nominal voltages

Voltage	Voltage [V]	Condition
General Conditions		
Nominal voltage	3.700	

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Voltage	Voltage [V]	Condition
Lower extreme voltage	3.5	
Higher extreme voltage (fast charging)	4.1	
HW Shutdown Voltages		
Vmstr+	2.1 ± 0.1	Off to on
Vmstr-	1.9 ± 0.1	On to off
SW Shutdown Voltages		
Sw shutdown	3.1	In call
Sw shutdown	3.2	In idle
Min Operating Voltage		
Vcoff+	3.1 ± 0.1	Off to on
Vcoff-	2.8 ± 0.1	On to off

Power key and system power-up

When the battery is placed in the phone, the power key circuits are energized. When the power key is pressed, the system boots up (if an adequate battery voltage is present).

Power down can be initiated by pressing the power key again and the system is powered down with the aid of SW. The power key is connected to EM ASIC (N2200) via the PWRONX signal.

Modes of operation

Mode	Description
NO_SUPPLY	(Dead) mode means that the main battery is not present or its voltage is too low (below EM ASIC master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32 kHz oscillator is running (RTC is on).
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over EM ASIC master reset threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator is on. PWR_OFF (cold) mode is almost the same as PWR_OFF (warm), but the RTC and the oscillator are off.
RESET	Reset mode can be entered in four different ways: by connecting the charger, by RTC alarm, by IBI pulse or by pressing the power key. Hardware controlled regulators are on. VCTCXO is powered. After 16 ms delay Gazoo enters POWER_ON.
POWER_ON	PurX is released. The system control goes mainly to digital ASIC and software (EM ASIC can still power down system in case of over heating).
DEEP SLEEP	VCTCXO powering is off and the system is running with the sleep clock. Regulators are in sleep mode.
COMA mode	New power save mode (power domains) in RAPU

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Clocking scheme

In BB5.44, two main clocks are provided to the system: 38.4MHz RF clock produced by VCTCXO in the RF section and 32.768kHz sleep clock produced by EM ASIC N2200 with an external crystal.

32 k Sleep Clock is always powered on after startup. Sleep clock is used by RAPU for low-power operation.

SMPS Clk is 3.2MHz clock line from RAPU to EM ASIC N2200. In deep sleep mode, when VCTCXO is off, this signal is set to '0'-state.

CLK600. The clock source is an internal RC oscillator in EM ASIC N2200 (during the power-up sequence) or RAPU SMPS Clk.

Bluetooth has a separate 38.4MHz TCXO clock oscillator.

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Power distibution

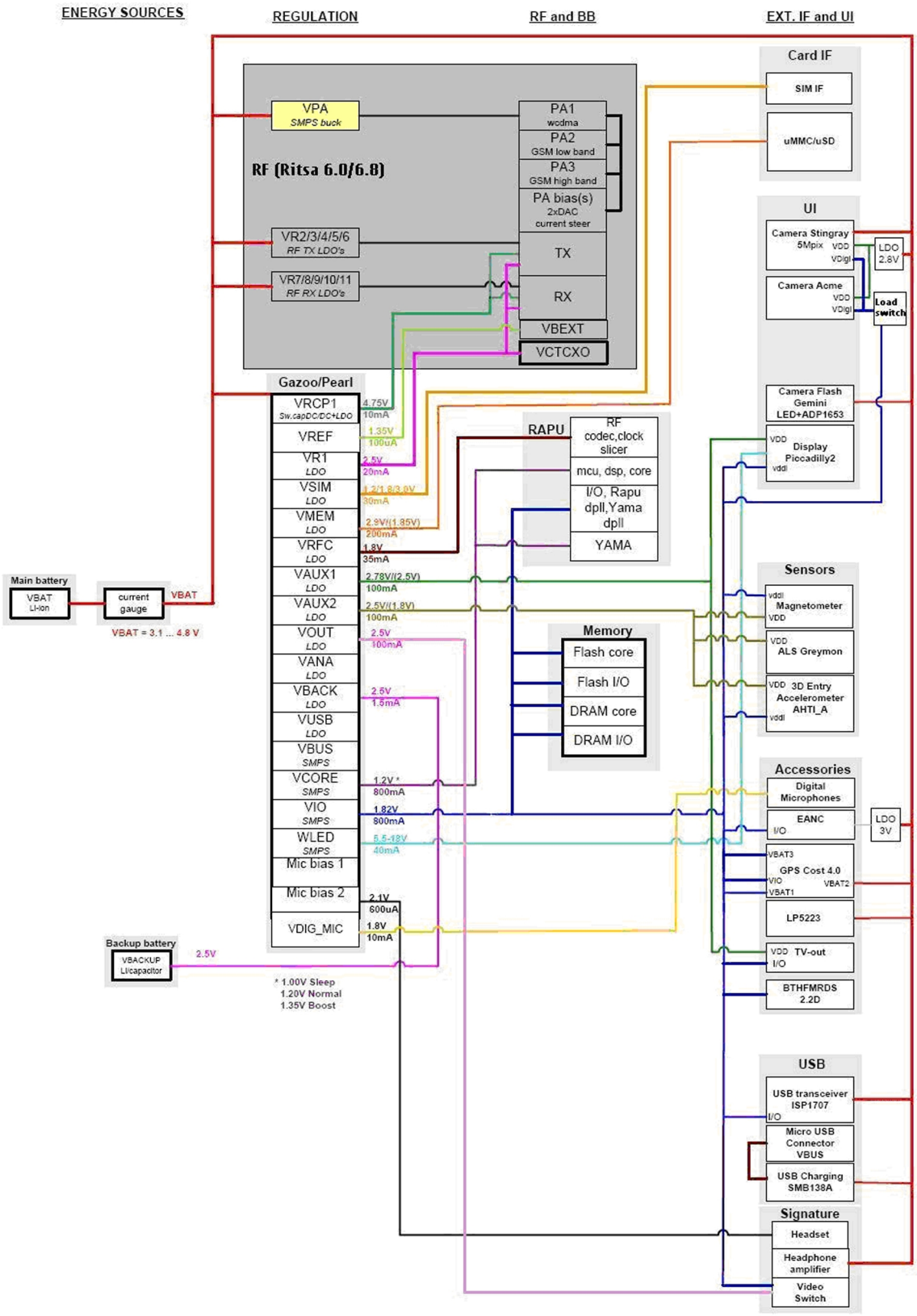

Figure 52 Power distribution diagram

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SIM interface

The phone has a SIM (Subscriber Identification Module) interface including a SIM connector. The connector is only accessible when the battery is removed.

The SIM interface consists of an internal interface between RAPU and EM ASIC (N2200), and an external interface between EM ASIC and SIM contacts.

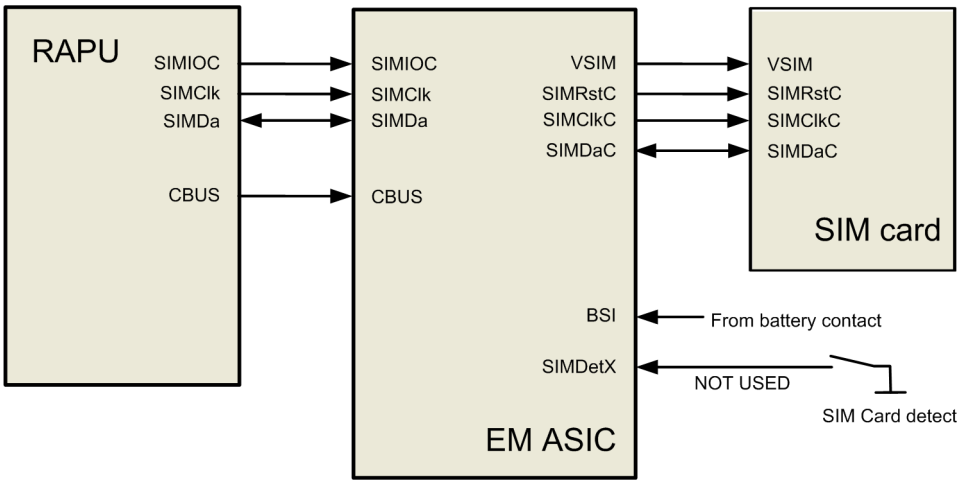

Figure 53 SIM interface

The EM ASIC handles the detection of the SIM card. The detection method is based on the BSI line. Because of the location of the SIM connector, removing the battery causes a quick power down of the SIM interface.

The SIM interface supports both 1.8V and 3.0V SIM cards. The SIM interface voltage is first 1.8 V when the SIM card is inserted, and if the card does not response to the ATR (Answer to Request), a 3V interface voltage is used.

MicroSD card interface

The microSD card interface has one internal interface between RAPU and EM ASIC and one external interface between EM ASIC and the microSD card. The microSD card connector is mounted on a separate PWB, the Micro PWB.

The removal of a microSD card is detected by a push detect switch.

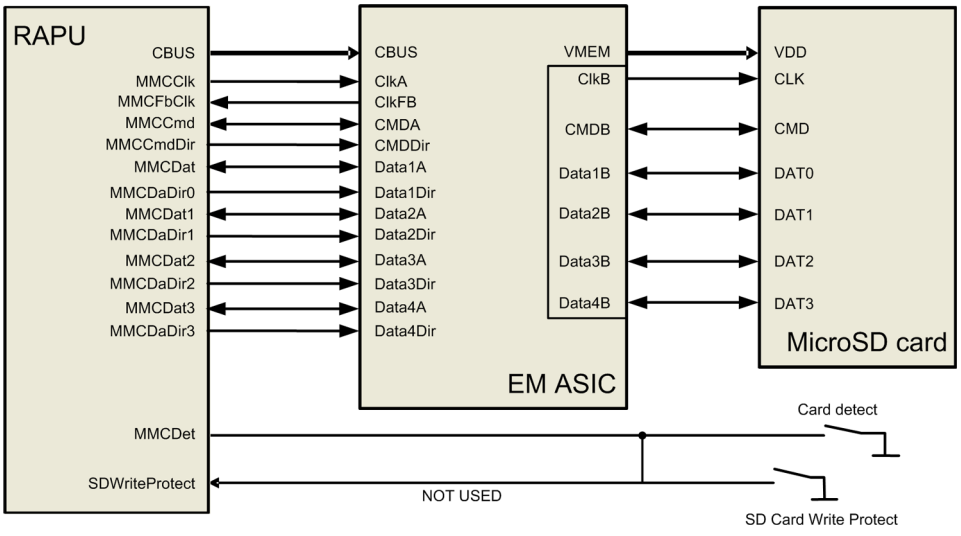

Figure 54 MicroSD card interface

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USB

USB interface

The phone has an interface for USB (Universal Serial Bus). USB is a differential serial bus that provides a wired connectivity between a PC and peripheral devices, as in this case a mobile phone.

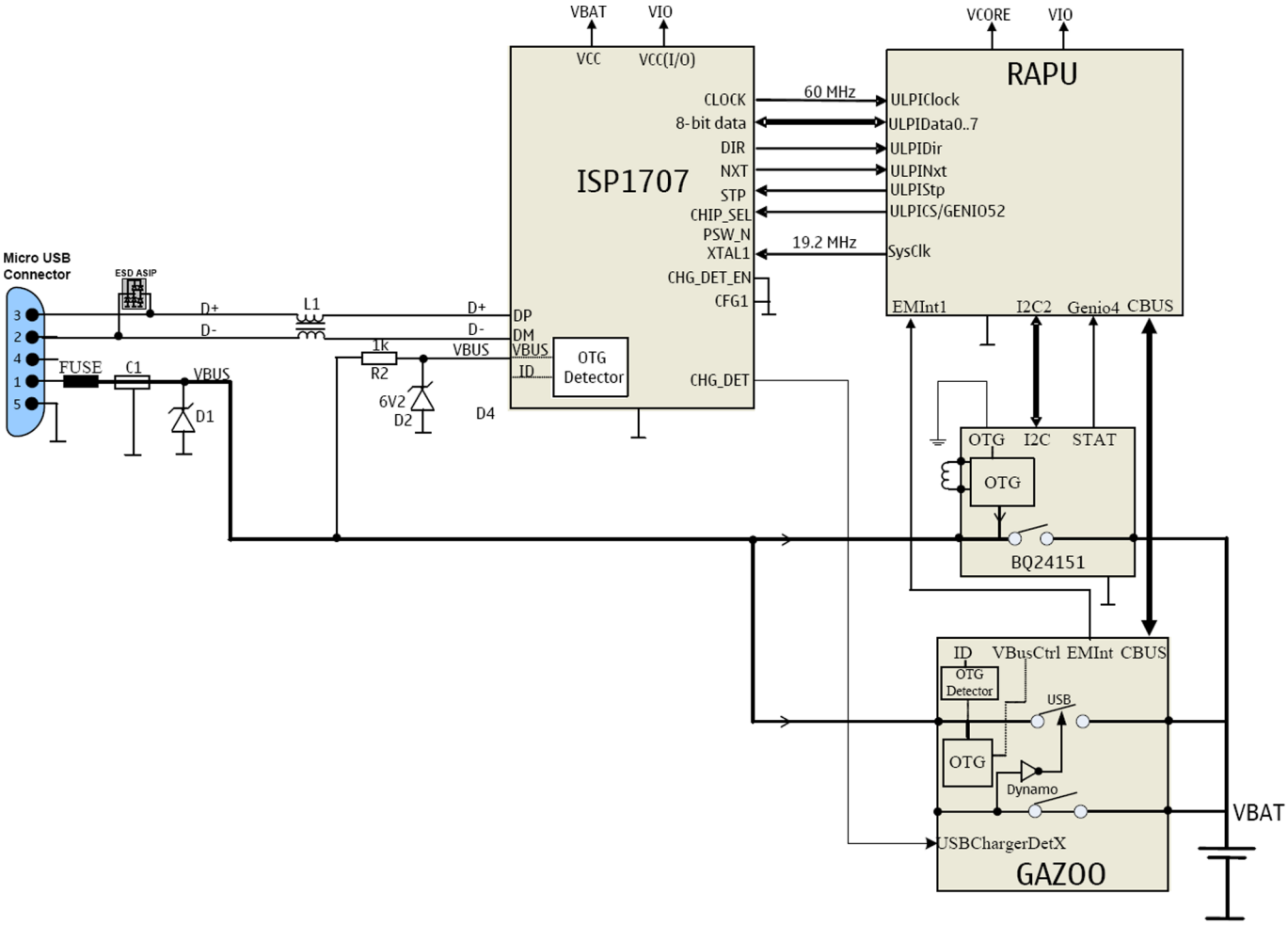

Figure 55 USB interface

The phone supports USB 2.0 with High-Speed (480 Mbps).

Hot swap is supported, which means that USB devices may be plugged in and out at any time.

MicroUSB connector

This phone is provided with a specific connector for microUSB.

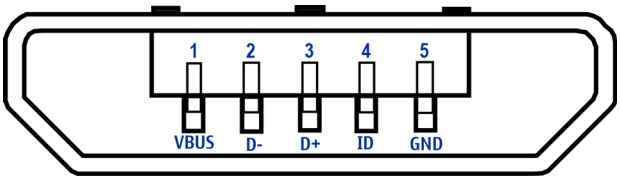

Figure 56 MicroUSB connector

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TV out interface

TV out interface

The device has a TV-out interface that includes a TV-out graphics engine. The engine supports composite video output (CVBS) and NTSC or PAL output standards. CVBS is single video signal containing all of the necessary information to reproduce a color picture.

Global supply voltages are VIO and VAUX1. VCORE and VPLL supply voltages are regulated with external regulator LP5952 using VIO and supply voltage from battery VBAT.

The TV-out video signal is wired to the AV connector through an EMC filter.

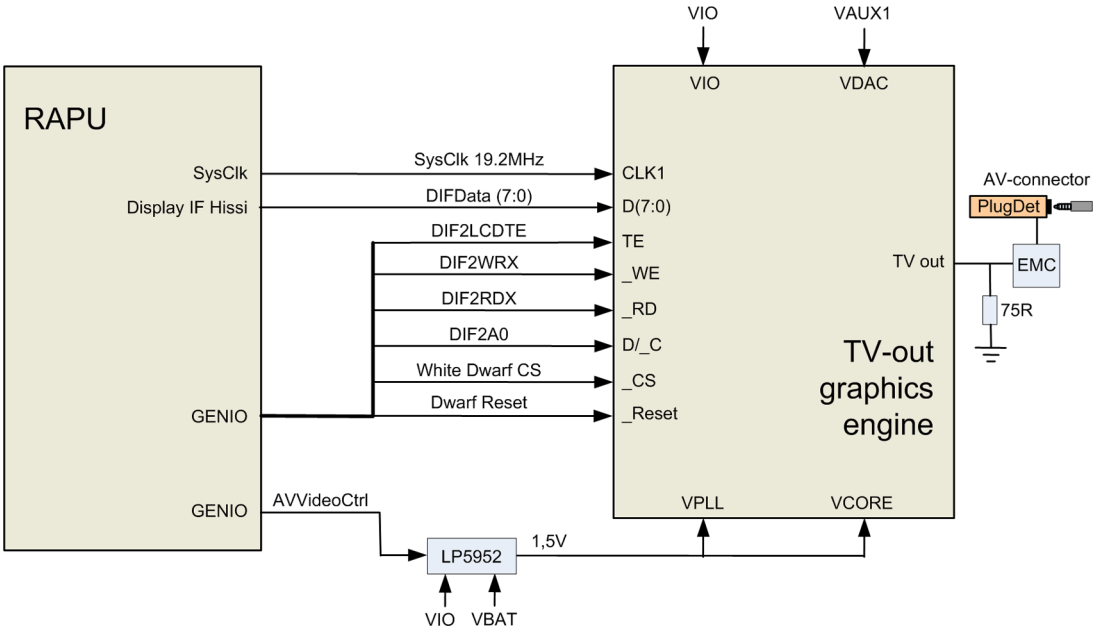

Figure 57 TV-out interface

AV connector

The AV connector handles both audio and video signals output. It has audio left and right signals separately (pins 4 and 5) and TV-out (CVBS) and microphone signals wired to the same pin (pin 3), because they are not in use at the same time.

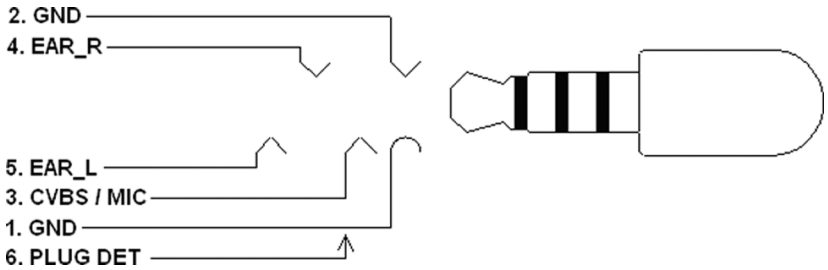

Figure 58 AV connector

The AVVideoControl signal handles TV-out and microphone usage of the AV connector. The plug detection signal handles the AV connector plug detection with HeadDet signal from EM ASIC.

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User interface

Display interface

The following block diagram illustrates the display interface.

Display backlight is provided directly by EM ASIC.

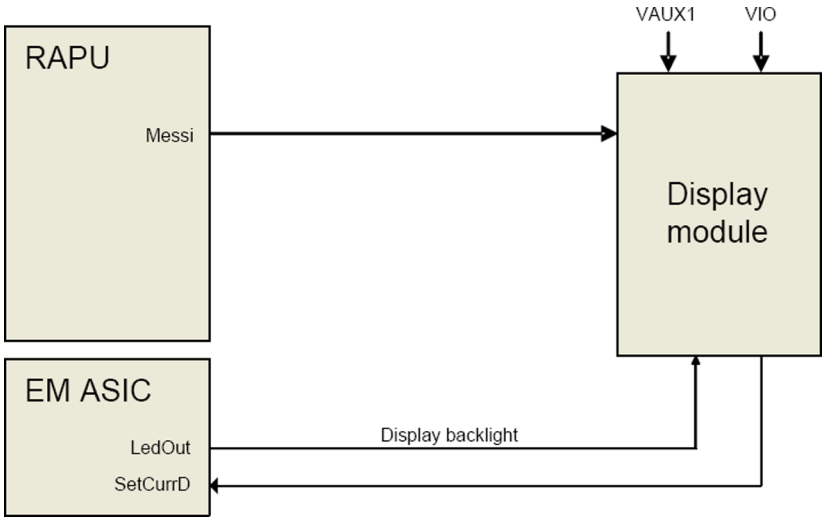

Figure 59 Display interface

Keyboard interface

The following block diagram shows the keyboard interface. The keyboard interface is implemented with RAPU's GENIOs. Keyboard GENIOs are protected from ESD with 10-channel ASIP Z4404 and 2-channel ASIP Z4405.

RM-424 keyboard supports 3 keys multikeypress functionality.

The keypad LEDs are controlled by a separate LED driver. The driver is controlled by the I2C bus port 2 (adr. 0x33).

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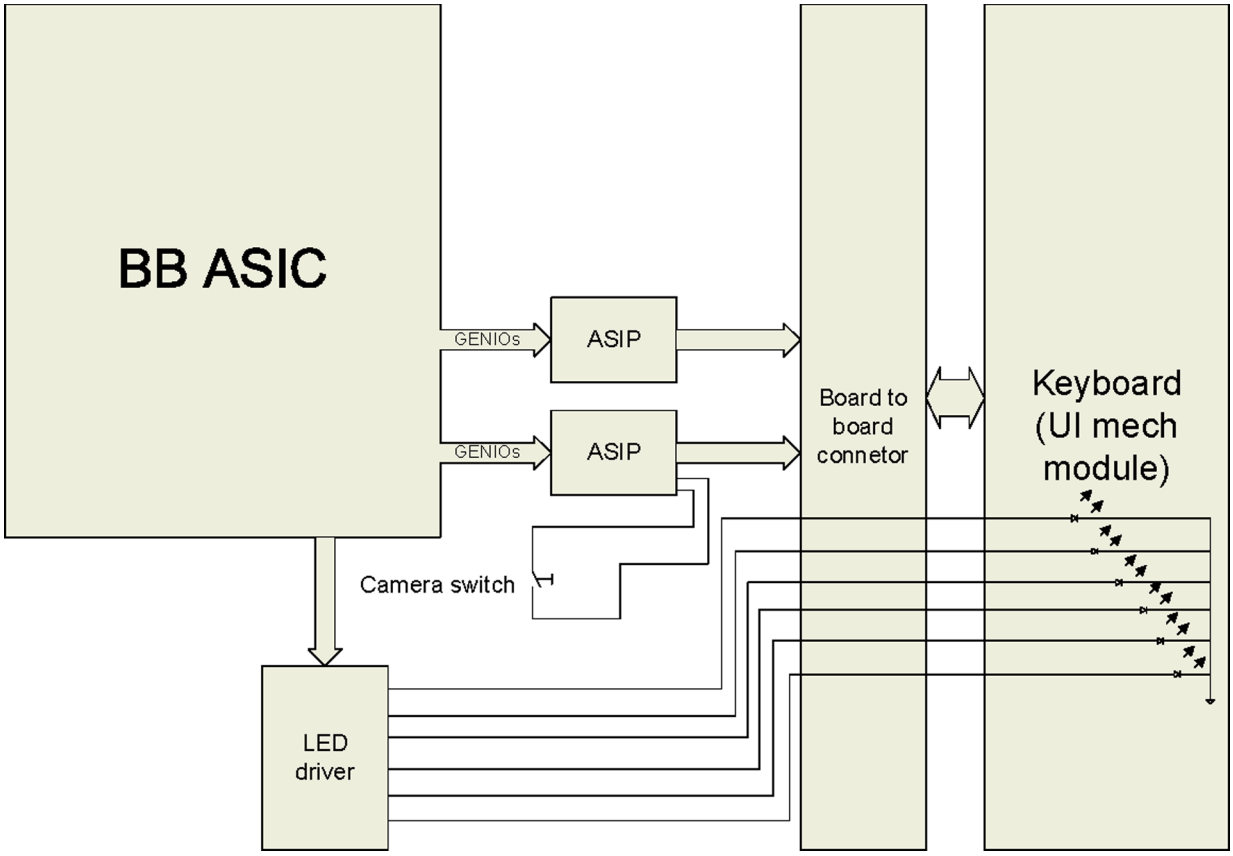

Figure 60 Keyboard interface

Ambient light sensor (ALS) interface

Ambient light sensor information is used to control keyboard and display brightness.

- Keyboard backlight is turned OFF, when it is not needed.
- Display brightness is dimmed, when environment lighting is dark.

The ambient light sensor is calibrated in production and can be re-tuned in service points, though not recommended unless calibration coefficient is lost for some reason

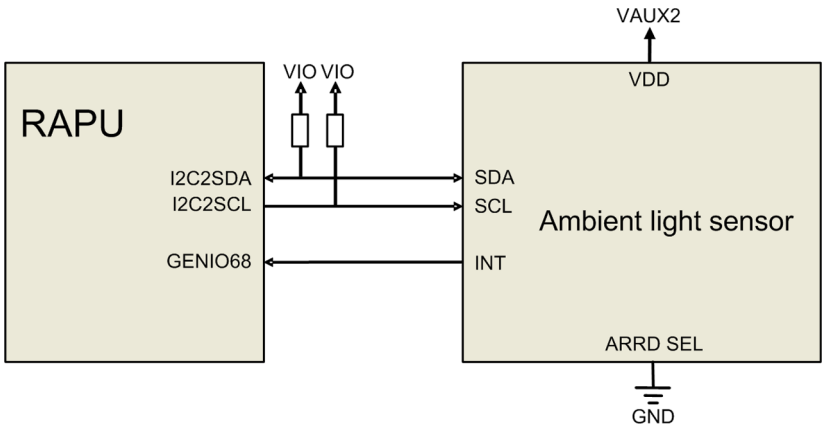

Figure 61 Ambient light sensor (ALS) interface

Accelerometer

The accelerometer measures the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion or shock.

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It has the following features:

- 2.16V to 3.6V supply voltage
- 1.8V compatible IOs
- Low power consumption
- ±2g/±8g dynamically selectable scale
- I^2C/SPI digital output interface
- Embedded self test
- 10000g high shock survivability
- Pb free/RoHS compliancy

The accelerometer (N1102) is connected to I2C. One GENIO is reserved for interrupt.

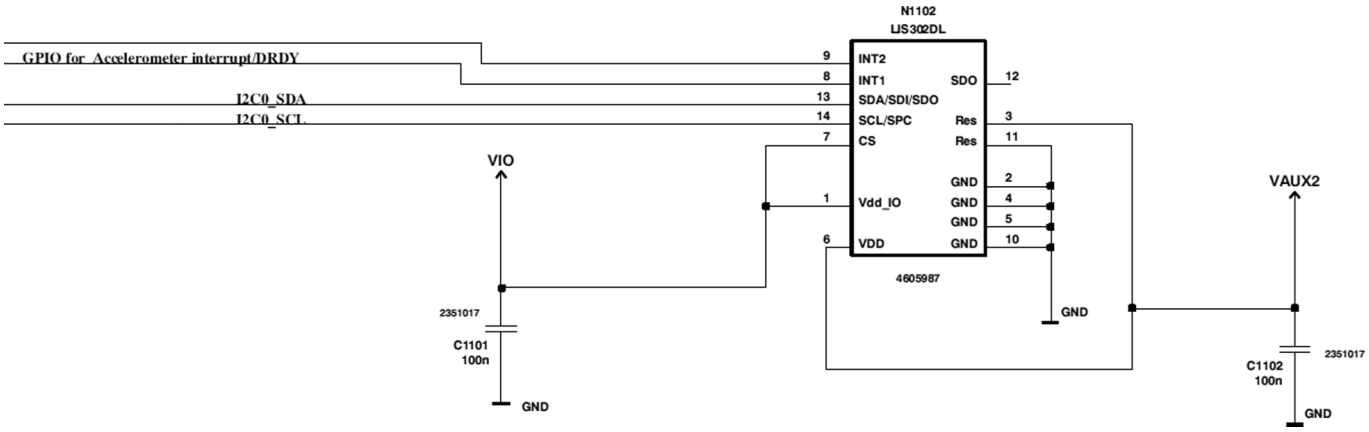

Figure 62 Accelerometer

Magnetometer

The device has an I2C controlled 3-axis magnetometer for compassing purpose.

The magnetometer has the following features:

- 3-axis magnetometer device suitable for compass application
- Built-in A to D converter for magnetometer data out
- Self test function
- I2C bus interface
- Power modes: OFF mode, stand-by mode and active mode
- DRDY function for measurement data ready
- INT function to inform exceeding magnetic field strength threshold.

The operating temperature is -20°C to +85°C.

The operating supply voltages are:

- Analogue supply +2.4V to +3.6V
- Digital interface supply +1.70V to analogue supply voltage.

GPS interface

The device includes an inbuilt GPS receiver and it works as a stand-alone positioning device.

The GPS system is connected to RAPU ASIC.

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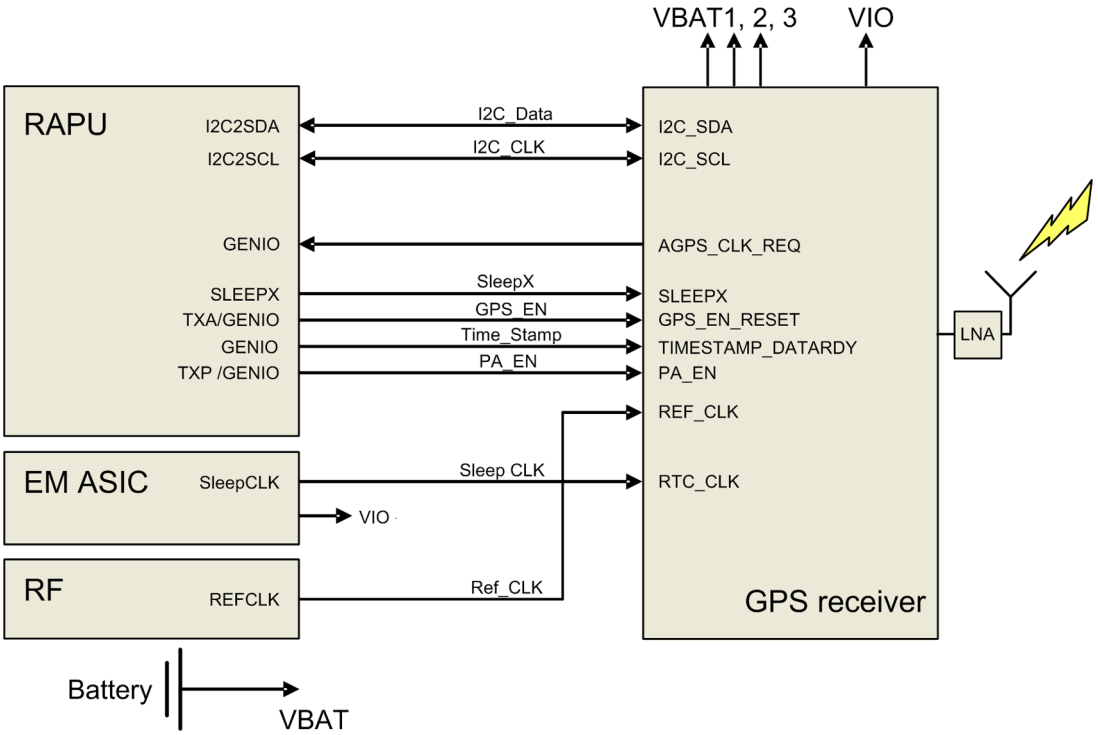

Figure 63 GPS interface

Camera interface

The device has an autofocus type main camera. The main camera is able to take images from 10 cm to infinity.

In this device the main camera, the secondary camera and the camera flash driver are connected directly to RAPU and controlled by the I2C bus, port 0. Both cameras are supplied by separate voltage regulators enabled by the camera software (GENIOs).

Control signals to and from the camera flash driver are connected directly to RAPU (GENIOs).

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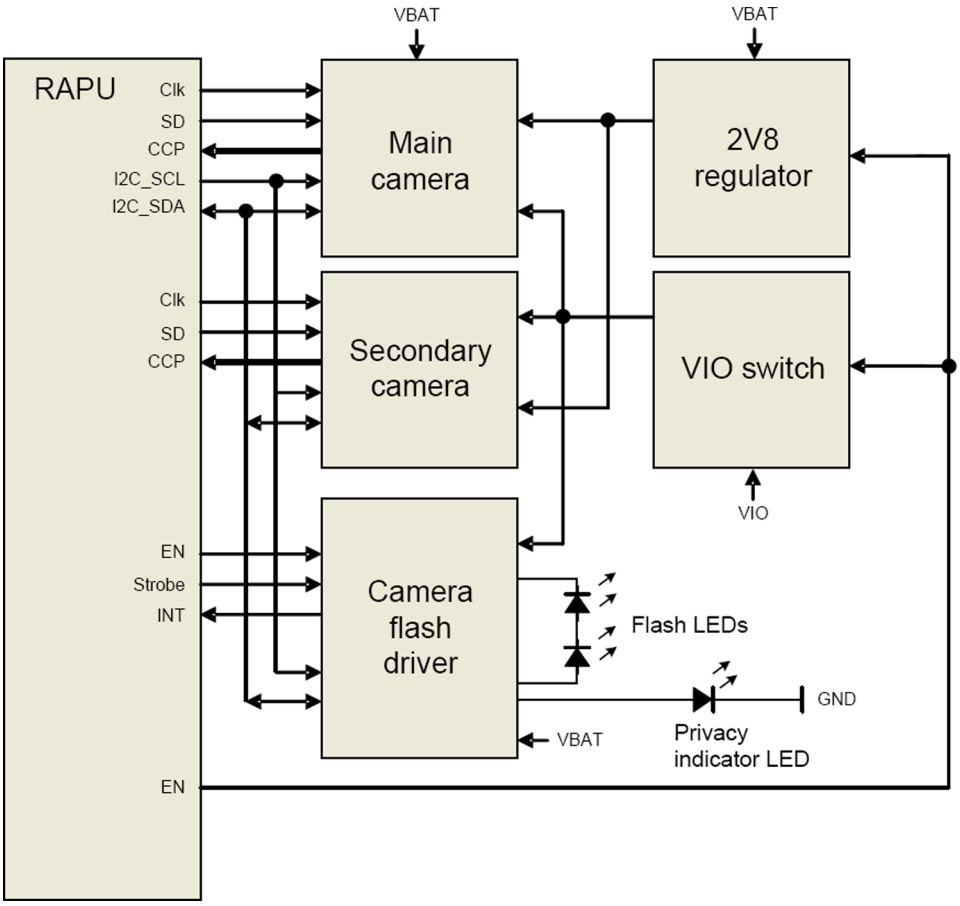

Figure 64 Camera interface

Audio interface

The following block diagram illustrates the audio interface of the phone:

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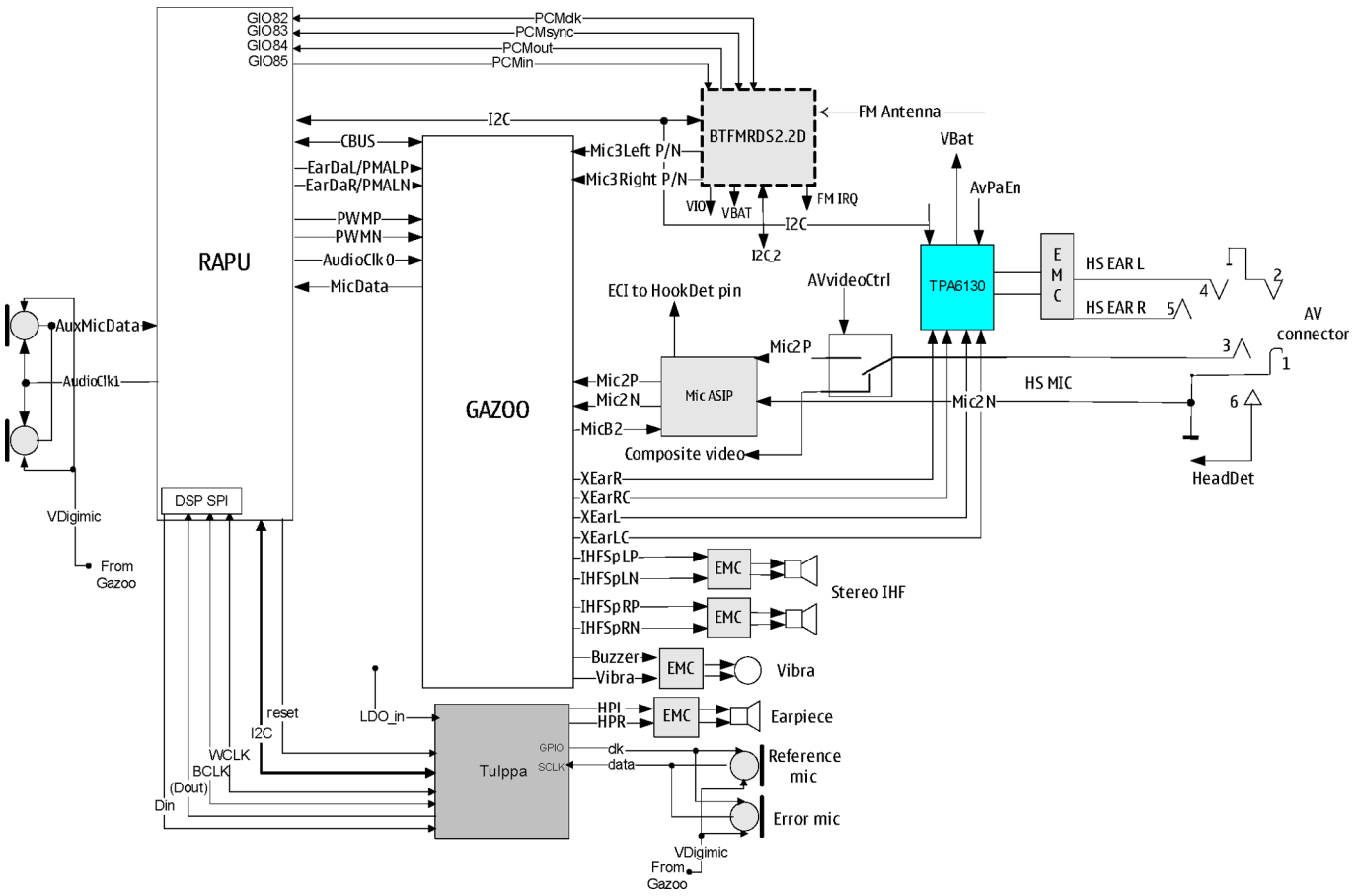

Figure 65 Audio interface

The digital uplink microphones are connected directly to RAPU. There are two uplink microphones: primary and secondary. They are required for the uplink Two Microphone Noise Cancellation (2micNC) algorithm and are located at the lower end of the phone.

Stereo output is provided by a separate stereo audio amplifier which is connected to EM ASIC. The output from the stereo audio amplifier is fed to the AV connector.

The earpiece is driven by Tulppa chip which includes an amplifier and Earpiece Active Noice Control (EANC). The EANC utilizes two digital microphones: the one next to the earpiece is called error microphone and the other close to the main camera is called reference microphone.

The stereo IHF speakers are driven directly by a built-in stereo amplifier included in EM ASIC.

The vibra is driven directly by a built-in amplifier included in EM ASIC.

Bluetooth interface

Bluetooth provides a fully digital link for communication between a master unit (the phone) and one or more slave units (e.g. a wireless headset). Data and control interface for a low power RF module is provided by the BTHFM module.

Bluetooth is physically integrated with FM radio in the BTHFM module ASIC, but from a functional point of view they have nothing in common

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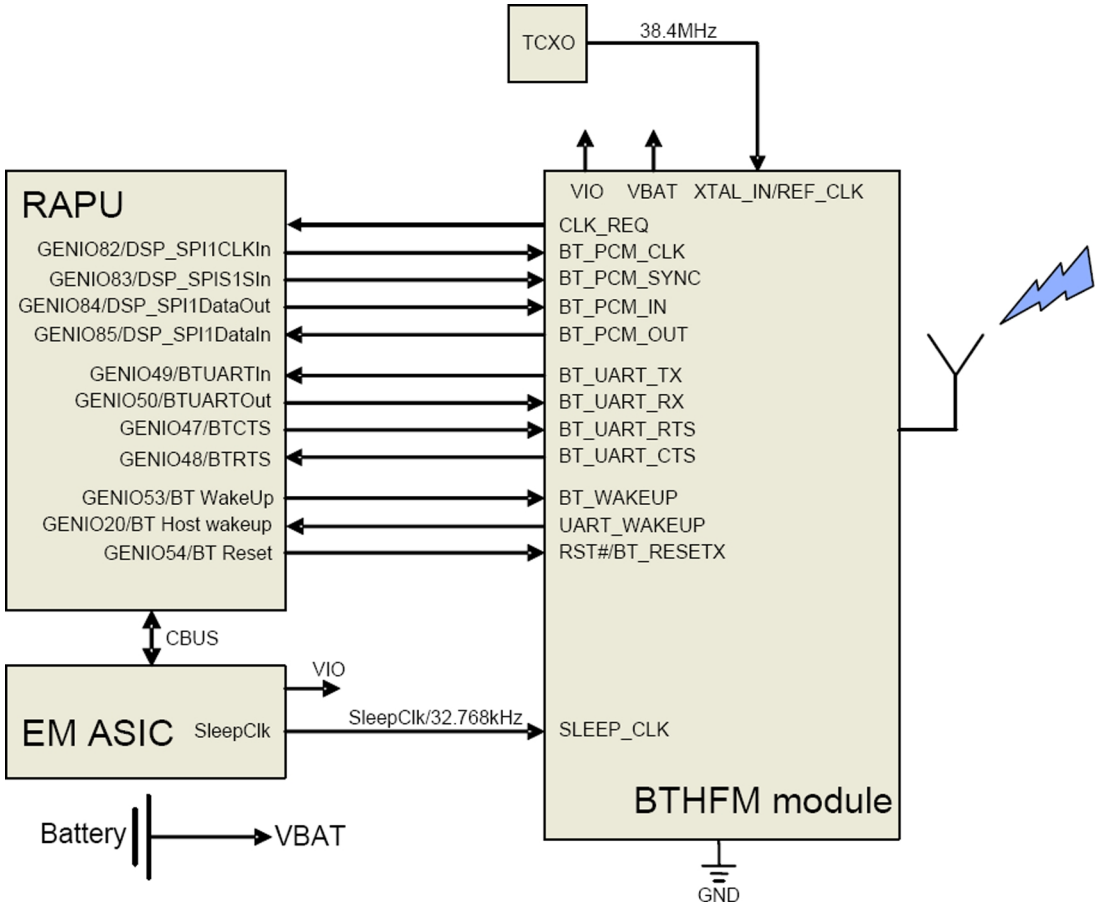

Figure 66 Bluetooth interface

The BTHFM module is powered by VBAT and the regulated voltage VIO. For audio applications the Bluetooth has a PCM data bus. In addition an UART (universal asynchronous receiver/transmitter) is used for data communication and controls.

FM radio interface

The FM radio system is controlled by RAPU via the I2C bus. EM ASIC delivers the needed voltages and the clock reference (32.768kHz SleepClk). EM ASIC also processes the analog audio.

The FM receiver fully supports reception over US/European (87.5MHz to 108MHz) FM band. The FM receiver comprises an RF receiver with fully integrated VCO, a stereo FM demodulator and a RDS demodulator.

A headset accessory is used as an external antenna. The headset is connected to the AV connector.

FM radio is physically integrated with Bluetooth in the BTHFM module ASIC, but from a functional point of view FM radio and Bluetooth have nothing in common.

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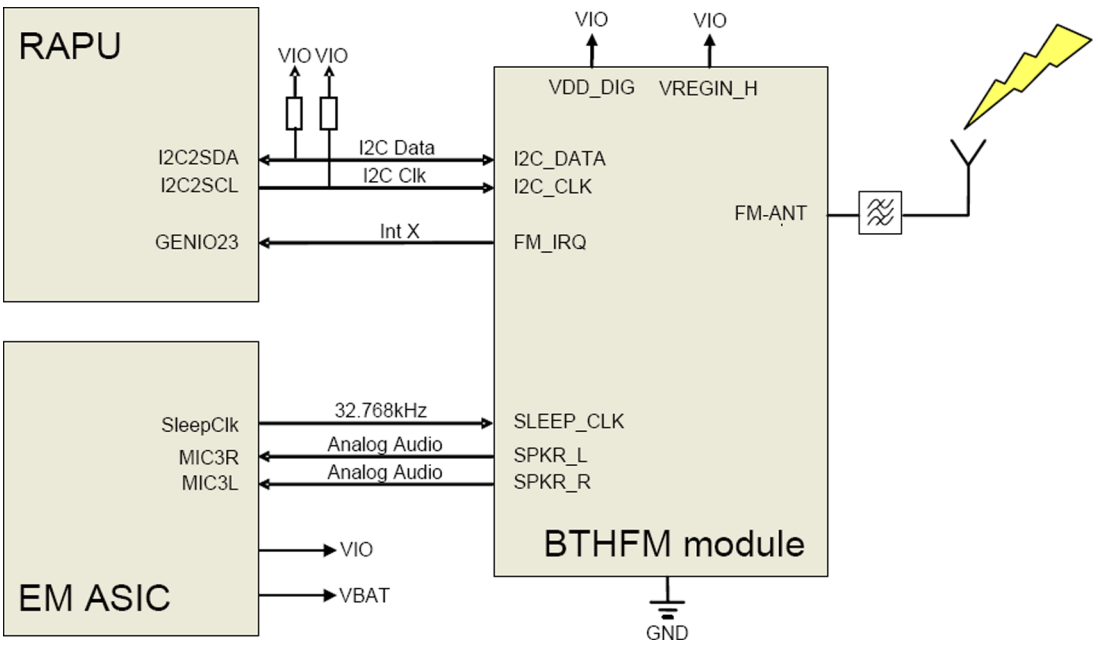


Figure 67 FM radio interface

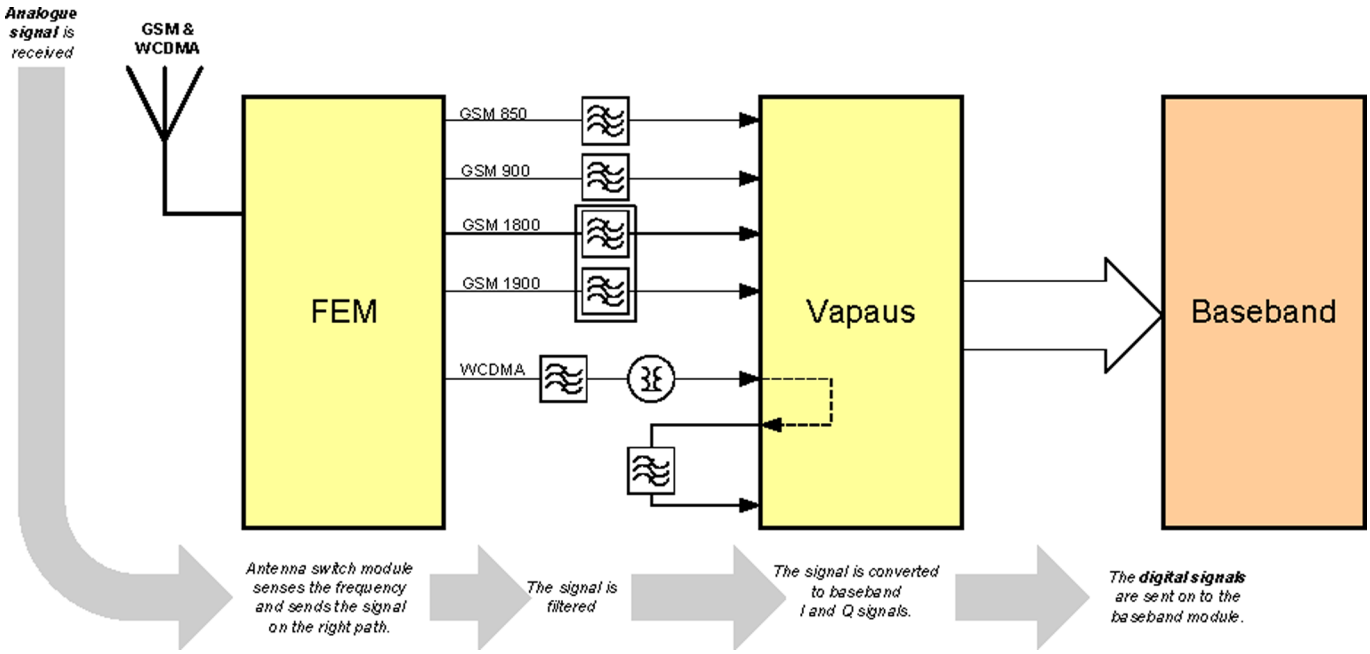
RF description

Receiver (RX)

An analogue signal is received by the phone's antenna. The signal is converted to a digital signal and is then transferred further to the baseband (e.g. to the earpiece).

The receiver functions are implemented in the RF ASIC.

Signals with different frequencies take different paths, therefore being handled by different components. The principle of GSM and WCDMA is the same.



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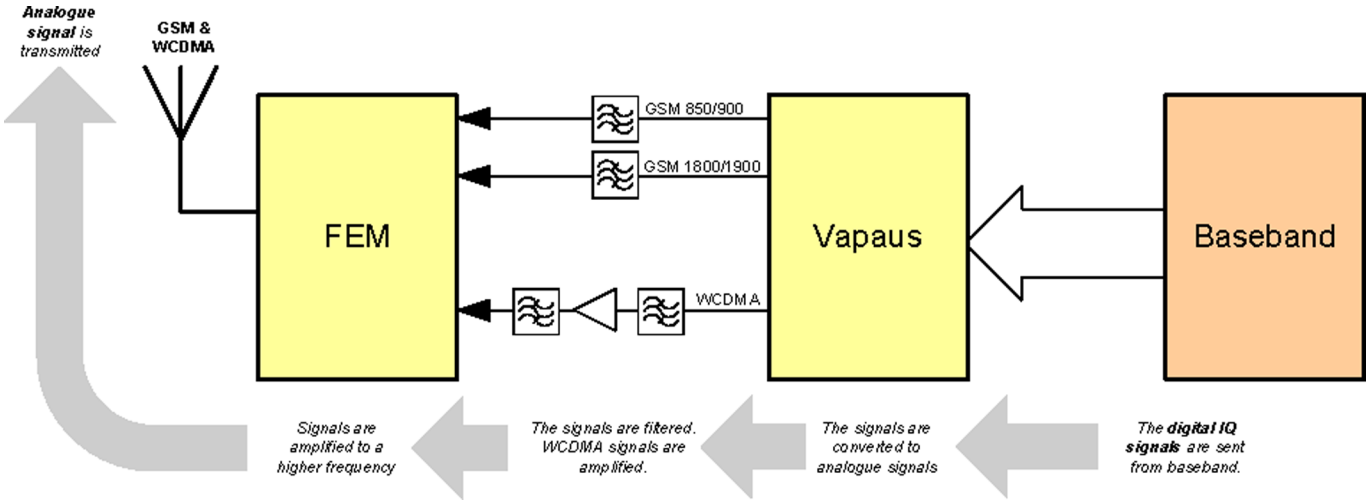
Transmitter (TX)

The digital baseband signal (e.g. from the microphone) is converted to an analogue signal, which is then amplified and transmitted from the antenna. The frequency of this signal can be tuned to match the bandwith of the system in use (e.g. GSM900).

The transmitter functions are implemented in the RF ASIC.

Even though the GSM and WCDMA signals are sent via different components, the principle of the transmission is the same.



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7 — Service information differences between RM-564 and RM-424

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RM-564 product data

RM-564 is a WCDMA band variant of Nokia 6720 classic. The key product data differences between the RM-564 and RM-424 are described below.

Connectivity

Table 13 Remote connectivity

Operating bands	RM-564: EGSM 850/900/1800/1900, WCDMA/HSDPA 850/1900/2100 (V/II/I)

Sales package

- Transceiver RM-564
- Battery (BP-6MT)
- Charger (AC-8C)
- Stereo headset (HS-125)
- MicroUSB connectivity cable (CA-101D)
- MicroSD card 1GB (MU-22)
- Mini-DVD (Ovi Suite)
- Short User Guide

Product and module list

Module name	Type code	Notes
System/RF Module	2QM	Main PWB with components.
Flash flex	2QF	
UI flex	2QH	

BB troubleshooting

PWB markings in RM-564 and RM-424

Mechanically RM-564 and RM-424 are identical and thus the HW differences are noticeable only by taking a closer look at the PWB. As illustrated in the figure below, the markings on the PWB enable quick differentiation between the two variants.

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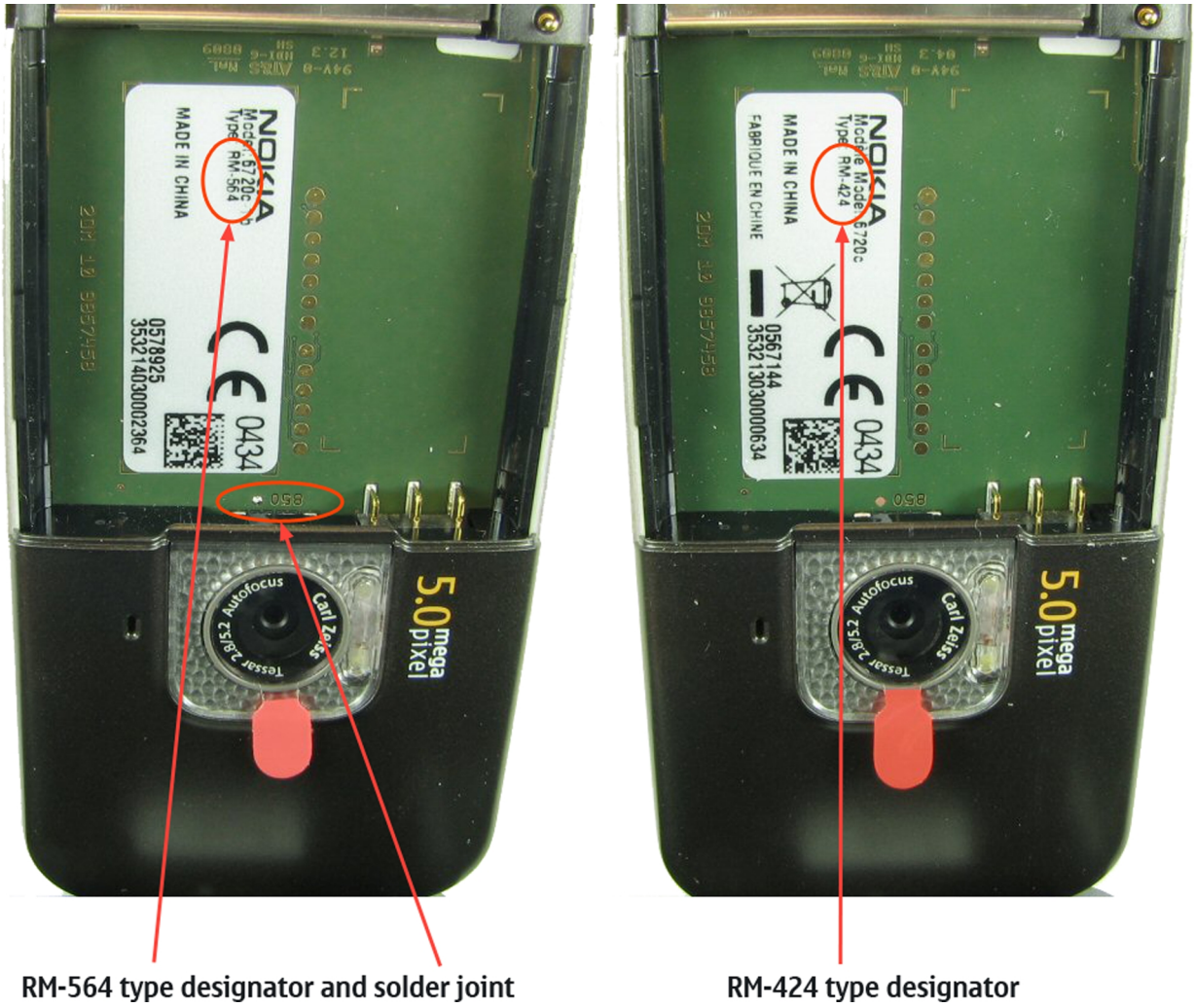

Figure 68 PWB markings in RM-564 and RM-424

RF troubleshooting

RM-564 RF block

RM-564 is a WCDMA variant of the RM-424 with three different WCDMA RF components in the RF block .

The following three components are different between RM-424 and RM-564:

- RM-424 part codes:
  - Z7521 4511124
  - Z7542 4512072
  - Z7544 4511798
- RM-564 part codes:
  - Z7521 4511791
  - Z7542 4512068
  - Z7544 4511797

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Glossary

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A/D-converter	Analogue-to-digital converter
ACI	Accessory Control Interface
ADC	Analogue-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BA	Board Assembly
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic (type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2, UEME and Zocus
CCP	Compact Camera Port
CDMA	Code division multiple access
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSD	Circuit-switched data
CSR	Cambridge silicon radio
CSTN	Colour Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analogue converter
DAC	Digital-to-analogue converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo

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DCT-4	Digital Core Technology
DMA	Direct memory access
DP	Data Package
DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DTM	Dual Transfer Mode
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evolution
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GMSK	Gaussian Minimum Shift Keying
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HSDPA	High-speed downlink packet access
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared

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IrDA	Infrared Data Association
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode
LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
MTP	Multipoint-to-point connection
NFC	Near field communication
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architecture
OMAP	Operations, maintenance, and administration part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x and BB5
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency

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RF PopPort™	Reduced function PopPort™ interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multimedia Card
RSS	Web content Syndication Format
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver
SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noise ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCP/IP	Transmission control protocol/Internet protocol
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPnP	Universal Plug and Play
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator

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VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
VF	View Finder
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WCDMA	Wideband code division multiple access
WD	Watchdog
WLAN	Wireless local area network
XHTML	Extensible hypertext markup language
Zocus	Current sensor (used to monitor the current flow to and from the battery)

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